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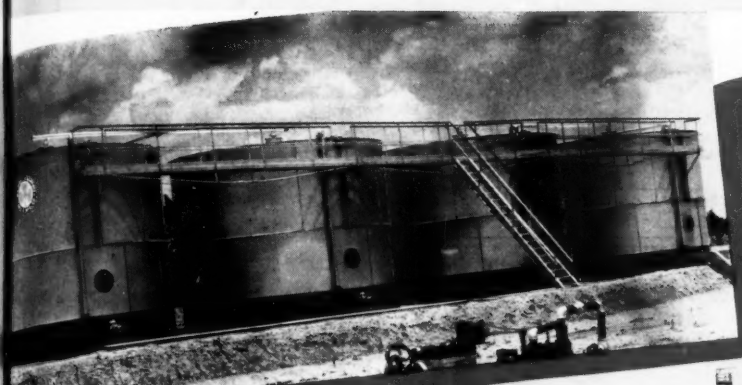

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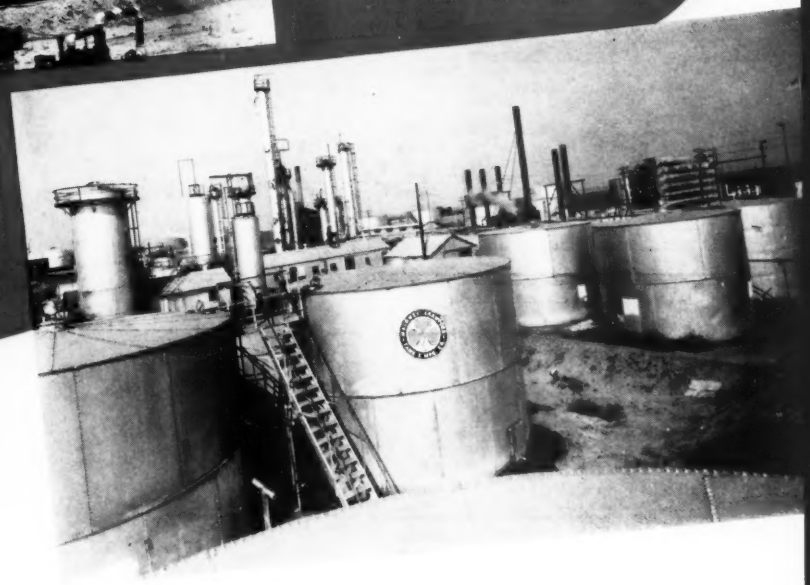

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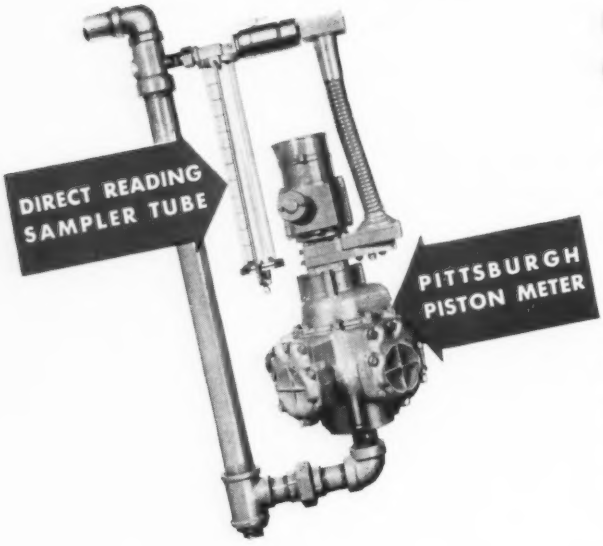

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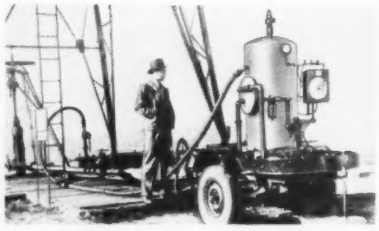

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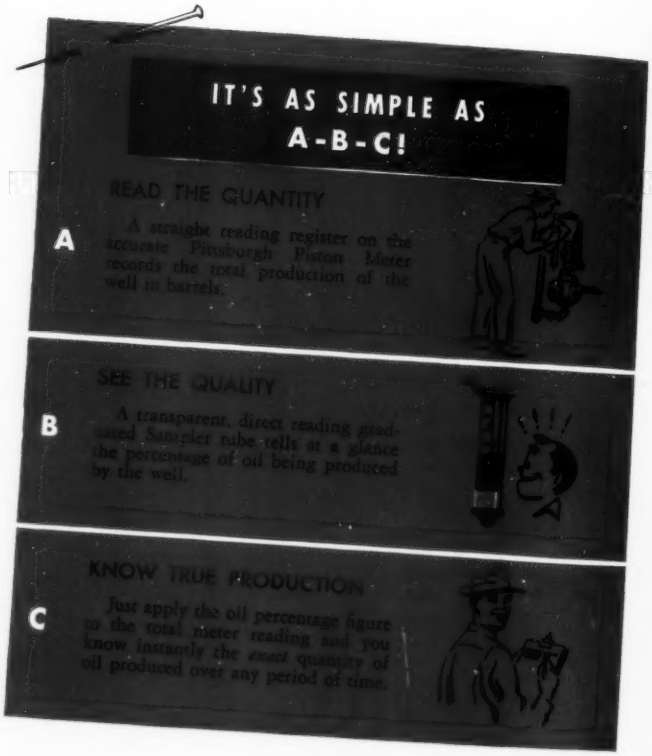
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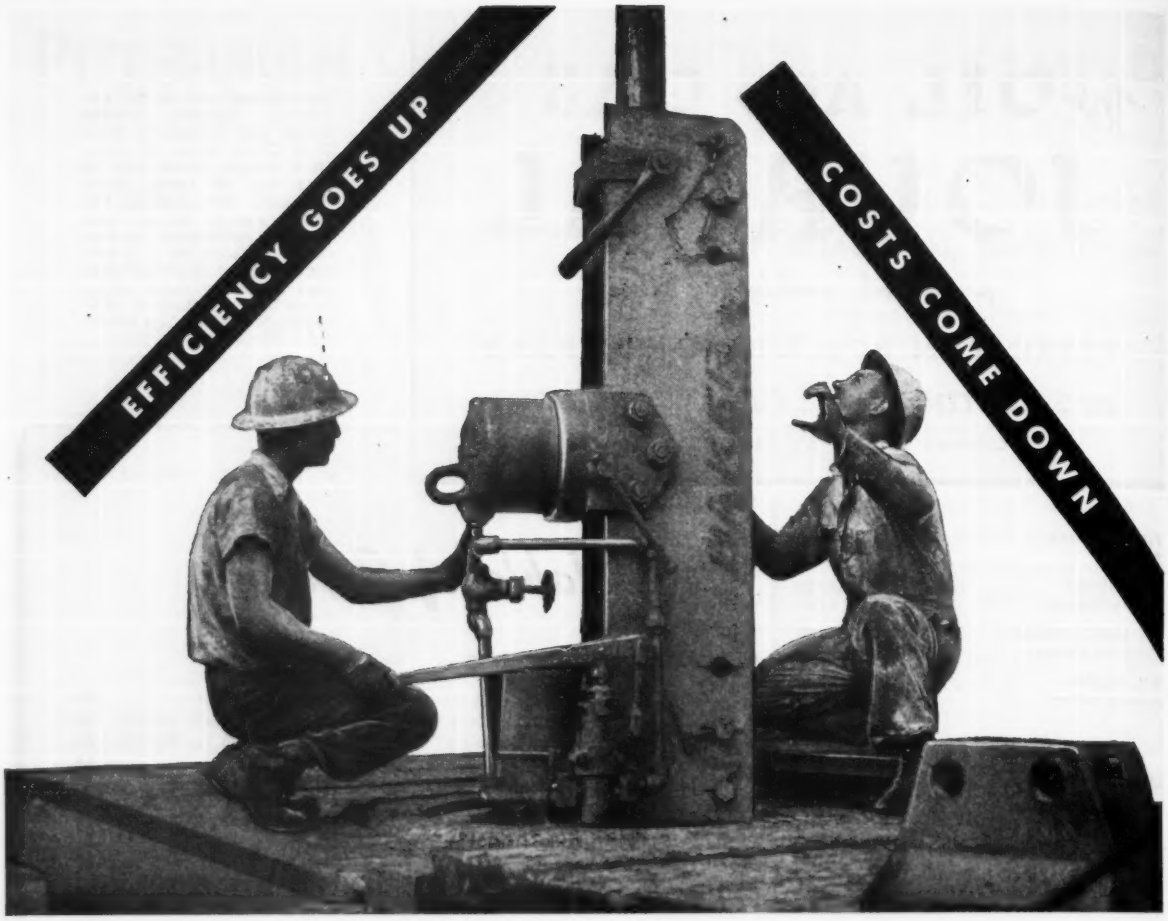

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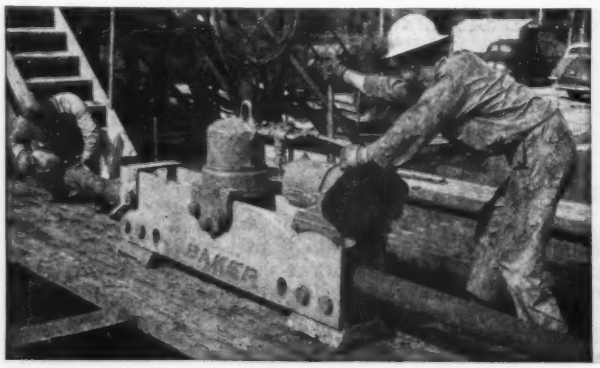

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Interstate Oil Compact

THE program of curtailing government functions that have a bearing on oil operations as part of the plan to reduce federal expenditures, emphasizes the industrial position of the Interstate Oil Compact Commission and poses the question as to whether its activities should be expanded to take over some of the services that will be dropped at Washington.

The oil compact has come a long way since its beginnings in 1935. It started with a membership of a half dozen oil states, all of whom joined, as one member said at the time, "with their fingers crossed." Each member feared that the others would force actions prejudicial to oil development within his own state.

Fortunately it was not long before the original members realized that the provisions which makes all state compacts possible was not incorporated in the federal constitution to aid one state at the expense of another, but rather was designed to create an interstate body, based on voluntary cooperation of each member, which would operate in the interest of all.

Some of the smaller and newer oil-producing states expressed fears that the compact would function only in the interest of the larger and older oil states. That apprehension was dissipated when several of the states attended the quarterly meeting as observers. As a result the membership now includes 19 oil and gas-producing states.

Functioning largely through standing committees, the membership, with the aid of a small staff and assistance within the industry, has been in the forefront of conservation programs. The titles of the committees—research and coordinating, regulatory practices, legal, economics advisory, stripper wells, public lands, and interstate relations—indicate the scope of the work being carried on.

Many objectives of a decade ago are now accomplished facts. Furthermore, carrying on interstate activities through a compact has been termed the democratic way of achieving programs beneficial to suppliers and consumers—and so it has proved to be in the oil industry. Moreover, there is plenty of evidence to support the contention of observers that the oil compact commission has prevented the advocates of federal oil control from realizing their objectives several times over the past 12 years. Proponents could not obscure the fact that the state conservation bodies working alone and through their compact were doing a good job.

In a rapidly expanding industry there are always new problems. The compact has served the industry and the public well and can do more if given the opportunity. Prompt action by those who have the responsibility of leadership within the compact and the industry can, in large measure, offset the pending losses in Washington oil services.

Stanolind's Synthol Plant To Be In Operation in 1949

FRENCH LICK, Ind.—The proposed synthol plant of Stanolind Oil & Gas Co. in Hugoton field, Kansas, will be producing gasoline from natural gas on a commercial scale in 1949, J. H. Forrester, manager of manufacturing for Stanolind, declared here before a joint technical meeting of leading scientists of Standard Oil Co. (Ind.) and affiliated companies.

Forrester said the new plant will produce 5,300 bbl. of gasoline daily, 800 bbl. of fuel oils, 1,060 bbl. of light hydrocarbons, and about 500,000 lb. of chemicals.

J. E. Latta, of Stanolind's Tulsa laboratories, said the oxygenated compounds formed as byproducts "will be useful in various fields as solvents, antifreeze preparations, and raw materials for the manufacture of fine chemicals. Included are alcohols, ketones, organic acids, and aldehydes."

About 150 technical men attending the meeting heard D. P. Barnard, associate director of research of Standard Oil Co. (Ind.), predict that newly developed, high-octane fuels will yield about 20 per cent more mileage than the best current practice as soon as new engines for automobiles are designed to take advantage of them.

R. M. Prather, of the company's chemical - products department, told the technicians the remarkable results obtained from synthetic detergents will intensify a current "boom" in their manufacture.

Prather said the normal annual soap consumption is about 3.5 billion pounds and estimated a future annual use of 1 billion pounds of synthetic detergents.

In a paper on safety, J. H. Johnsen, assistant head engineer in the Whiting, Ind., refinery, asserted oil refining is one of the safest occupations with an average accident rate of 6.7 per million man hours against 13.6 for all industry. The refineries of Standard Oil Co. (Ind.) are even safer, he said, with an accident rate of only 1.2 per million man hours.

More than 80 technical papers were presented at the meeting, including as subjects such as improved methods of removing salt from crude oil, high-vacuum techniques in the refinery, selective weed killers, more efficient horticultural fungicides, and new chemical applications for alkanesulfonic acids.

OGD Vital to Nation's Security, Hallanan Tells Senate Group

WASHINGTON.—Strong pleas that sufficient funds be voted to permit the Oil and Gas Division to continue its current activities were made before the Senate appropriations committee last week during hearings on the Interior Department appropriations bill.

The oil industry's position was expressed by Walter S. Hallanan, chairman of the National Petroleum Council, and by Gordon Duke, chairman of the National Council of Independent Petroleum Associations, both of whom criticized the House appropriations committee for implying that OGD exists only to serve the industry and help it do what would otherwise be a violation of the antitrust laws.

Max W. Ball, director of OGD, explained to the committee the work currently being done to assist the military and civilian government-procurement agencies in obtaining adequate supplies of petroleum products, as well as other services OGD renders to the Government. He insisted that OGD has no intention of consolidating all government oil and gas activities within itself but exists primarily as a coordinator of policies and programs to prevent, in his language "the Government from jumping on its oil and gas horse and galloping off in all directions."

The committee seemed primarily interested in the legal authority for the existence of the Oil and Gas Division, and both Ball and Hallanan declared that since the secretary of the interior has general responsibilities over the Government's petroleum interests and activities he ha ample authority to maintain a small staff organization to assist him in this work.

Continuance of OGD is not a matter of life and death to the oil industry, but it is of vital concern to the security of the country, Hallahan declared. He traced the history of OGD and NPC to show that the proposal originated with the House petroleum committee and was endorsed by the special Senate committee on petroleum resources, and that the oil industry did not ask that either be created.

Duke also said that OGD is more important to the Government than to the industry, and he challenged the suggestion that OGD is functioning as a trade association, declaring that the industry is capable of taking care of itself without government assistance.

Power Conference to Be Conducted in Cleveland

The nineteenth annual Oil and Gas Power Conference of the American Society of Mechanical Engineers will be held May 21-24 in Hotel Statler in Cleveland.

A pre-conference series of three lectures on diesel fuel oils will be conducted May 20, including: "Production of Diesel Fuel Oils," C. A. Rehbein, Shell Oil Co., Inc., New York; "Physical and Chemical Characteristics of Diesel Fuel Oils," R. D. Pinkerton, Sinclair Refining Co., East Chicago, Ind.; and "Combustion of Diesel Fuel Oils," Dr. M. A. Elliott, Bureau of Mines, Pittsburgh. Another paper, "Diesel Fuel-Oil Situation," will be presented May 22 by E. F. Miller and F. L. Nelson, Socony-Vacuum Oil Co., Inc., New York.

New Company Plans 100 Wells in Texas

More than 100 wells will be drilled within the next 12 months in the Anton-Irish area of Lamb and Hale counties, Texas, by Anton Oil Corp., newly organized firm which will operate in Texas, New Mexico, and Kansas, company officials have announced.

J. Roy McCoy, formerly with Leland Fikes, Dallas, and in charge of the new company's geological and production departments, said the firm has several thousand acres under lease. George Etz and E. H. Robertson are in charge of Anton's operations, and Roy L. Crawford, formerly with Leland Fikes, is chief landman.

Kansas Hearings Scheduled

A statewide hearing will be conducted by the Kansas Corporation ommission May 23 in Wichita on new legislation which requires the commission to promulgate and adopt rules and regulations concerning the drilling of oil and gas wells and the protection of fresh-water strata.

These were the participants in the I.P.A.A. forum on "Foreign Oil": Howard W. Page, economist, Standard Oil Co. (N. J.); Harold B. Fell, I.P.A.A. executive vice president; L. F. McCollum, Jersey Standard official; and Minor S. Jameson, Jr., I.P.A.A. economist

Imports: A Threat or a Blessing?

Views Vary at I.P.A.A. Forum

by Dahl M. Duff

WAYS of coping with a possible domestic shortage of petroleum products over the coming months serious enough to threaten a "back-door" approach to federal regulation of the industry, dominated discussion at a forum on "Foreign Oil" which featured the midyear meeting of directors of the Independent Petroleum Association of America May 8-9 in Jackson, Miss.

L. F. McCollum, coordinator of producing activities for Standard Oil Co. (N. J.), one of the four forum speakers, told the group that the critical problem facing oil producers, both in the United States and abroad, is whether the industry will be able to meet the demands placed on it. In view of this, he said, regulation of imports at this time is a "purely academic problem."

The forum marked the first time representatives of a major company have appeared before the independent producers' organization. It climaxed the final day of the meeting and developed a lively floor discussion of an hour or more duration, centering mainly on the domestic supply problem.

The remarks of L. F. McCollum, Standard Oil Co. (N.J.) vice president, on world supply problems, foreign producing activities, and import regulation are published in abridged form beginning on page 62.

Page's Demand Projections

Basis for McCollum's discussion was laid in a paper by Jersey Standard's second representative on the program, Howard W. Page, head of the company's coordination and economics department. Page gave a comprehensive picture of worldwide supply and demand in which he estimated world requirements for petroleum in the next 5 years will increase some 2,100,000 bbl. daily, or about 30 per cent over 1946.

In the United States, even with a business recession, demand for prime products except residual fuel oil will increase 4.5 per cent by the end of next winter, Page said, and if industrial activity remains high, demand is expected to rise more than 7 per cent.

"New transportation and refining facilities are under way and planned but with material shortages and slow deliveries, very little new capacity will become operable before the end of next winter," Page declared. "The problem in meeting demand is, therefore, one of maximum utilization of existing capacity."

The position of the I.P.A.A. for regulation of imports to protect domestic producers was redefined and expanded by the other two speakers on the forum program, Harold B. Fell, Ardmore, Okla., executive vice president of the association, and Minor S. Jameson, Jr., economist on I.P.A.A.'s Washington staff.

A Plan to Control Imports

Following out the I.P.A.A. policy for imports only in such quantity as to supplement domestic production, Fell outlined a machinery by which he said this could be accomplished. He proposed that working stocks, demand, and maximum-efficient domestic-production rates be determined periodically by state regulatory agencies working with the cooperation of the Interstate Oil Compact Commission. If it were found, Fell continued, that total United States production at maximum efficient rates would not provide sufficient crude to meet domestic and export demand and maintain above ground stocks, "we would immediately find our above-ground stocks starting to decline at a rate easily determinable and then it would be necessary to import crude petroleum and its products in such quantities as to offset the decline in stocks."

Voluntary cooperation of importing companies, Fell said, would be essential to carrying out the program, but if for any reason importers failed to conform, then it would become necessary to ask Congress for legislation to effectuate the plan. Though not adopted by the I.P.A.A., Fell said the program he outlined had been the subject of considerable study by its various officials.

McCollum and Page in their discussions agreed that the domestic producers must be encouraged and protected and that imports should be only supplementary. It was on the question of whether any regulation at this time is necessary in view of world demand that their views diverged from those of the I.P.A.A. officials. All four speakers concurred that there is no shortage of potential petroleum productive capacity or reserves and that many of the present problems result from war-retarded development and construction of facilities.

Fell said: "The cries that we hear of an impending shortage of petroleum and its products are nothing new. They have been heard practically ever since the inception of the industry, but given adequate money and materials, an effective conserva-

tion program and sound tax provisions, the domestic petroleum industry has never failed to provide the supply . . . necessary for our military and civilian needs.

Price and Materials Handicaps

"During World War II, the oil producers were severely handicapped as a result of an inadequate price for crude oil and shortages of materials and manpower. They simply were unable to drill the wells that should have been drilled in the face of the ever-increasing demand. . . . It must be recognized, however, that it has only been a short time since we have had any substantial increases in the price of crude oil and that many producers have not as yet been able to build up the financial reserves necessary to carry out a drilling program."

The fear that imports may destroy the domestic producer's investments, Fell continued, must be eliminated. Among other needs of the domestic producers, he listed the following: A price covering replacement cost plus a reasonable profit; adequate manpower and materials; the assurance of continuation of the percentage depletion allowance and the option to expense intangible drilling costs; and the continuance of a sound and effective conservation program.

Making the first talk of the forum, Jameson reviewed government figures showing the United States is a net importer of oil to the extent of about 100,000 bbl. daily. "One inescapable conclusion" from present developments, he said, is that the domestic producer faces a very definite threat from foreign oil.

Majewski's Questions

B. L. Majewski, Chicago, Deep Rock Oil Corp., vice president for marketing of the American Petroleum Institute, emphasized the seriousness of the domestic supply problem in floor discussion following the prepared papers. Majewski brought to the meeting a resolution he said had been sent to him by the Burning Oil Distributors organization. This resolution called on Congress to remove petroleum import duties altogether and discontinue exports because of the domestic supply situation.

"Our responsibility is to meet this challenge and not excite the public to go in and ask for some kind of federal control. . . .," Majewski said. "These 12,000 marketers are the ones who will have to go to the public and say we haven't got the oil. I have their resolution and have come to this meeting with this question for Mr. Fell: 'What shall I tell them.' "

Fell said he thought the answer was fairly obvious. "We told the OPA and the Government that when we didn't get materials and an adequate price, we couldn't drill for oil. That's the whole story to it. We can find and get the oil, but the Government crippled us, and they're the ones who can be held responsible."

Majewski replied he didn't believe "the people would accept this kind of an explanation."

Majewski directed a second question to McCollum. "You said cooperation would go a long ways toward solving this problem," Majewski said. "I would like to know exactly what you mean."

McCollum said he recognized that federal control could come through "the back door of satisfying consumer demand," although the reasons for the present acute supply problem are well enough known. The problem, he said, requires complete industry cooperation. To "get over the hump," he continued, we should take a serious look at our exports, cooperate on a voluntary basis, move supplies of crude even at a high-cost basis out of such areas as West Texas, possibly concentrate on exploitation rather than wildcat drilling, and free hoarded pipe.

Effect of Present Import Tax

Russell Brown, Washington, general counsel of the I.P.A.A., asked McCollum if the present 10½-cent tax is preventing any imports. McCollum answered he did not believe it is and pointed out that foreign areas are now producing at maximum rate to meet increasing world demand.

Amplifying on this, Page said he doubted if in the next few months even complete elmination of the tax would help. "Some more oil will be available later in the year, possibly 50,000 bbl. daily, but more likely as little as 20,000 bbl. daily," he said. "There is no chance of refining it outside of the United States. It could be brought to New York and relieve Gulf Coast crude. Middle East crude can only be brought here at a considerable loss, but I think that if it is badly enough needed, it will be done."

Well-Head Natural-Gas Prices

N. G. McGowen, president of United Gas Corp., Shreveport, La., speaking on "Problems of the Natural-Gas Industry," in another session of the meeting, said well-head prices for gas is "a very misunderstood situation." Only a portion of the gas that flows through interstate gas lines, he pointed out, is subject to regulation of the Federal Power Commission, and the sale of the unregulated portion, that is, industrial sales, competes directly with other types of fuel. "There is no regulation for these sales in the world except the best regulator—competition," he told the meeting.

If an arm's-length contract with a gas producer is not made in good faith or at an excessively high price, "then I don't think you're going to get a chance to pass it on," he said. Also affecting well-head price, he continued, are the operators who build short intrastate lines to industries using large volumes of gas and undersell other transmission companies. Then there are industries which are attracted to the idea of building their own lines to supply themselves.

McGowen emphasized that he did not deny this right to operators or industries. "This is certainly American enterprise, and I believe in it—but free competition certainly has its effect upon all well-head prices.

"We hear of the 7 and 8-cent prices to be paid for gas for the major lines being built to the North and East, but unless one analyzes just what we deliver for these prices, he may be led astray," McGowen said. "Most of these prices are based on gas delivered to some common point on the main line at pressures of from 800 lb. and up. If the gas in the field is of low pressure, it is necessary for the seller of the gas to put in the equipment to raise the pressure. All such gas must be dehydrated, gathered, and delivered to the main line. All that costs money." The same problem confronts utilization of flare gas, and McGowen said the cost of picking up and delivering flare gas into the main line has in several cases analyzed by United varied from 2 cents per M.c.f. to slightly less than 4 cents without allowing any return on the investment.

Senator O'Mahoney

Speaking at the banquet, Sen. Joseph C. O'Mahoney (Dem., Wyo.), chairman of the former Senate special committee investigating petroleum resources, made a strong attack on monopolistic business enterprises. The Sherman antitrust law, he recalled, in a few years will be 60 years old, and "no political party has ever undertaken to urge its complete repeal, though suggestions for its temporary or partial abandonment have been made." The law, he said, is the most "distinctively American law ever enacted and constitutes the basic law of American business."

The senator outlined the four requirements for "economic freedom." These were:

1. Modification of the tax laws to create an incentive for the investment of capital.

2. Legislation to require business organizations operating abroad to file with the Government their contracts with foreign governments and competitors.

3. Legislation to "close the gap" against monopolistic mergers by prohibiting acquisition of assets of competing companies.

4. Recognition that organizations operating in interstate commerce—corporate or labor—should obtain

(Continued on page 148)

this week

PRODUCTION—Record U. S. crude production reaches new all-time high of 5,015,650 bbl., following unbroken period of 10 consecutive weekly gains. . . . Texas with output of 2,226,850 bbl., up 43,345 bbl. from previous week. . . . California, Illinois, Louisiana, and Mississippi also sharply higher. . . .

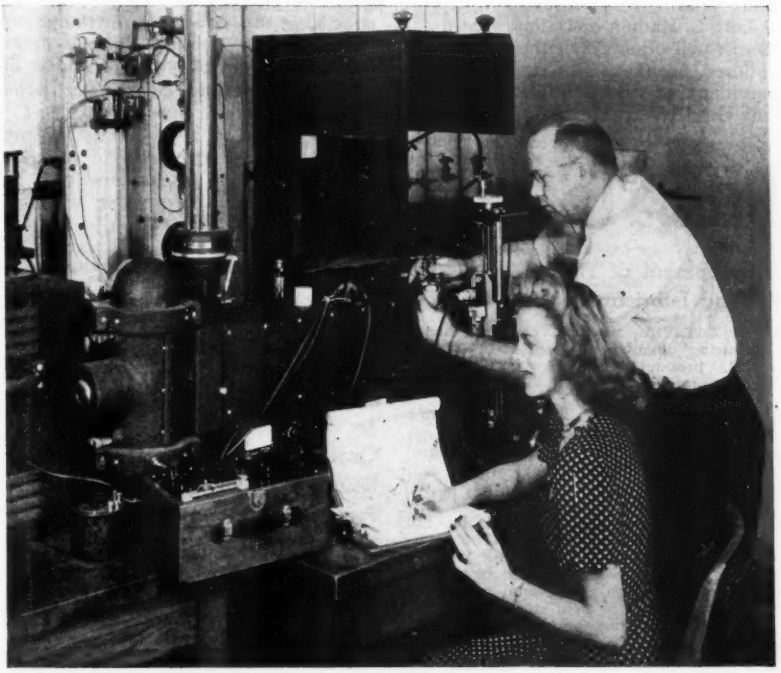
SUPPLY AND DEMAND—Tightening products supply continues to concern leaders of the industry. . . . ¶Bureau of Mines May demand forecast estimates 4,871,000-bbl.-daily crude production needed during current month. . . . Forecast reports actual total demand for all oils averaged 5,915,000 bbl. daily in January and set a new monthly record of 6,045,000 bbl. daily in February. . . . Heavy demand and withdrawals from refined stocks indicate, the forecast says, the necessity for an early seasonal buildup of fuel-oil stocks with refinery operations at capacity levels for balance of the year. . . . ¶Likelihood of a critical supply problem later this year takes major attention at I.P.A.A. forum on "Foreign Oil." . . . L. F. McCollum, Jersey official, says it is doubtful any substantial increase in imports could be made available to help present domestic situation. . . . ¶Strikes now in progress at several refineries add to current supply difficulties. . . ¶Market sources report scarcity of gasoline and continued rising prices for heavy fuel oil, now being quoted at figures as high as $2.50 in the Mid-Continent. . . .

INTERNATIONAL—London reports indicate early settlement may be forthcoming in dispute over purchasing by Jersey Standard and Socony-Vacuum of interest in Arabian American. . . . Settlement said to involve new accord between Iraq Petroleum partners. . . . ¶Compromise settlement reached in labor dispute between Argentine oil companies and workers. . . . Argentine Government official earlier announced seizure of plants under consideration. . . . U. S. State Department watching situation.

NEW COMPANIES—United Gas asks SEC approval of new subsidiary, Atlantic Gulf Gas Co., Inc., organized to carry out United's expansion in southeastern states. . . . ¶Alma Refining Co., newly organized with Phillips the major stockholder, buys Sweeny, Tex., plant from WAA for $13,100,000. . . .

CONGRESS—Senate appropriations committee hears industry representatives—Walter S. Hallanan, NPC chairman, and Gordon Duke, marketing association official—present arguments for continuation of funds for OGD. . . . Hallanan tells committee operation of the division is not life and death matter to the industry, but is of vital concern to the security of the country. . . .

EXPLORATION—Humble test in Fargo area of Wilbarger County, Texas, flows 107 bbl. oil first hour, 102 bbl. second hour, from Ellenburger pay, total depth 6,345 ft. . . . ¶Karnes County, Texas, discovery flows 1,027,000 cu. ft. gas, 48 bbl. condensate per day from Luling sand, 6,764-69 ft. . . . ¶San Jacinto County, Texas, has new pool opener rated 76 bbl. oil per day, from 7,682-7,702 ft. . . . ¶Union Oil extends Houma field, Terrebonne Parish, Louisiana, 1 1/2 miles. . . . ¶Bacon Hills discovery well in Kern County, California, pumps 56 bbl. 40.2°-gravity oil per day. . . .



***LOOKING INTO AN OIL FIELD BY X-RAY.**—Another advance of petroleum research is represented by this X-ray machine which forecasts how oil, gas, and water will flow through rock strata thousands of feet underground. The X-ray focuses on core samples into which oil, gas, and water are injected. The resulting "picture" shows in miniature the flow behavior to be expected. Dr. F. Morgan, of the Gulf Oil Corp.'s research-laboratory staff, Harmarville, Pa., is seen here adjusting a cylindrical core sample in the machine, while a secretary prepares to record the X-ray findings. Specifically, the apparatus determines permeability-saturation relationships. The X-ray beams follow the state of flow by means of an opaque tracer mixed with the liquid or gas. Variations in intensity of the beams, as they pierce the core, are caused by the tracer, indicating the extent of saturation*

JOHN M. LOVEJOY *JAKE L. HAMON* *MANCHESTER BODDY*
Speakers at the general session of the Los Angeles A.P.I. meeting

Ten Technical Papers Feature A.P.I. Meeting in Los Angeles

IN session May 15-16 at the Biltmore Hotel in Los Angeles for its spring meeting, the American Petroleum Institute Pacific Coast district, Division of Production, heard 3 general-session discussions and 10 technical presentations.

John M. Lovejoy of New York City, president of Seaboard Oil Co. of Delaware, spoke on "A Progressive Public-Relations Program for the Oil Industry," outlining the nation-wide program now under way to tell the American people the true story of oil. He emphasized, "We, in the industry, know the petroleum story better than anyone else. That is the reason why we must tell everyone about it while there is still time to do so."

Jake L. Hamon of Dallas, vice president for production of the A.P.I., was another speaker. Hamon is a past president of the Mid-Continent Oil and Gas Association, National Stripper Well Association, and is a director of the Independent Petroleum Association of America and is affiliated with numerous petroleum activities.

At the banquet and evening session culminating the first day of the meeting, Manchester Boddy, publisher of the Los Angeles Daily News, spoke on "America's Position in Europe," giving first-hand information secured from his recently completed extensive tour through many countries there.

In the following section, technical papers on the program are given in digest form.

(For the paper "New Electrical Logging Techniques in California" see page 82 of this issue, and for the paper "A General Pressure-Volume-Temperature Correlation for Mixtures of California Oil and Gases" see page 95 of this issue.)

DIGESTS—Los Angeles A.P.I. Papers

Development of Thread Sealing Lubricants

H. C. ZWEIFEL, research chemist, manufacturing department, and L. J. GRUNDER, products research and development engineer, Richfield Oil Corp.

LEAKAGE of fluids through threaded joints in the production of oil and gas may result in the loss of casing pressure, the possible infiltration of water and loss of product.

Deeper production has accentuated this problem, requiring improvement in the sealing of all threaded members. The problem resolves itself into sealing against leakage, and sufficient lubrication to prevent thread damage. Additional properties of rust prevention in field storage, and improved corrosion resistance in use are required.

Development of a satisfactory thread sealing lubricant resulted in rejection of conventional materials and indicated superiority for a combination of malleable metals. Upon application, it must be capable of adhering to and metallizing thread surfaces without undue separation caused by heat, weathering, oil or water, and capable of protecting, lubricating and sealing mating members.

Organization Elements: Their Relation to Oil and Gas-Producing Operations

J. E. TOUSSAINT, general manager, producing department, Standard Oil Co. of California, San Francisco.

FUTURE exploratory work, deeper wells, pressure maintenance, unit plans, secondary-recovery projects, etc., will become more important; and consideration of sound organization elements will be warranted to provide adequate and competent advice on these features.

Brief discussion of the following elements that warrant definite consideration are covered:

Geological, land and lease, construction and maintenance, drilling, production, petroleum engineering, purchase and stores, trucking and automotive transportation, gas processing and disposal, accounting, organization and planning, personnel, safety, labor relations, committees for coordination.

Four essential organization fundamentals or concepts are discussed under these headings:

1. There is no one particular organization arrangement or setup that is necessarily applicable to all cases.

2. Whatever organization arrangement is chosen should be clearly outlined by suitable chart and "job tickets" for each key position, and these combined in a management guide.

The line and staff-type organization is most generally suitable to an oil and gas-producing organization.

4. The concept of "optimum combination of major and minor factors" is discussed; indicating that to obtain optimum results, minor factors may have to operate at less than maximum efficiency to permit the major factors to operate at maximum efficiency.

Control of Unconsolidated Sand in Oil Wells

READ WINTERBURN, Union Pacific R. R. Co.

PERFORMANCE of 260 wells completed in the Tar, Ranger, and Upper Terminal zones in Wilmington field in California is reviewed with particular regard to the effectiveness of different types of perforated liners in controlling unconsolidated sand. The experiences indicate that prepacked and gravel-packed liners, using gravel small enough to screen the sand, are the most effective of any in use over extended periods. The analysis further shows that although absolute productivity is impaired in such wells, an economic gain is realized because of ability to produce at higher rates without sand troubles.

True Resistivity Determination From the Electric Log—Its Application to Log Analysis

H. G. DOLL, director of research; J. C. LEGRAND, technical department, and E. F. STRATTON, exploitation department, Schlumberger Well Surveying Corp., Houston.

DISTINCTION is established between the observed resistivity or apparent resistivity and the resistivity of the undisturbed formation or true resistivity. The general relation between the apparent resistivity and true resistivity is discussed; a method is described for determining the true resistivity of geological formations traversed by a bore hole through the application of resistivity departure curves to the apparent resistivity measured on the electric log.

Effects of electrode spacing, hole diameter, mud resistivity and invasion of the formation by mud filtrate are detailed, with examples given of their influence on the apparent resistivity.

Developing the application of resistivity departure curves to the analysis of the electric log, the importance of the true resistivity is indicated for the determination of quantitative data in producing horizons.

A short section is given outlining the electrode devices used in electrical logging of the bore hole.

Factors Influencing the Selection Of Mud Fluid for Completion of Wells

H. E. RADFORD, mechanical engineer, Coastal division, Shell Oil Co., Inc.

A REVIEW is given of previous reports and new evidence is provided to show that damage to the productive formation does occur due to action of clay-water mud on sands as drilling proceeds. Field evidence is presented to show that use of special muds tends to reduce the amount of damage done.

Principal objective in selecting a drilling mud for completion work is to obtain the maximum productivity for the given well. Each of the several special muds available have certain exclusive advantages which may result in their selection for a particular completion job. Characteristic advantages of these muds are pointed out and examples of their use under appropriate circumstances are given.

Where the problem is only to prevent damage to the sand by infiltration of water, it can best be solved by use of oil-base mud. Where other relative problems exist, as for example the presence of long section of open hole, or where there is need for a water-base electric log, or for a study of ditch shows, one of the special water base muds will be most desirable.

The Determination of Stresses in Oil Well Casing in Place

C. H. OBERG, Standard Oil Co. of California, Taft, Calif.; R. W. MASTERS, Standard Oil Co. of California, Avenal, Calif.

EQUIPMENT and method are discussed which determine the magnitude of the changes in stress in oil-well casing after it was in place in a well and while it was affected by varying temperatures and pressures during drilling and producing operations. Data from two tests indicate:

1. Casing landing tension varies greatly as the casing is affected by temperature and pressure conditions in the well.
2. Freeze point of the casing sometimes rises very rapidly from the top of the cement to the shoe of the next size casing.
3. Temperature and pressure changes tend to cause the casing above the top of the cement to move up or down through any freeze points that are quickly formed by caving formations.
4. All of the casing above the top of the cement tends to act as free casing because of the movement of the casing through the caved in freeze points.
5. Apparent freeze points above the top of the cement may cause erroneous landing weights.
6. Properly landed casing will not develop dynamic stresses of dangerous magnitude during drilling operations carried on inside of it.
7. Stress variations during producing operations are likely to be more severe than those encountered during drilling operations.

Recent Developments in Casing Standards and Design

JOHN WAIS, JR., Pittsburgh Steel Co., Los Angeles.

IMPORTANT changes in casing standards and design have been proposed during the past 5 years, but held in abeyance due to the war emergency. Discussion at the 1946 annual A.P.I. meeting in Chicago indicated an increased field demand for the revisions, and preliminary developments on several subjects are discussed in this paper.

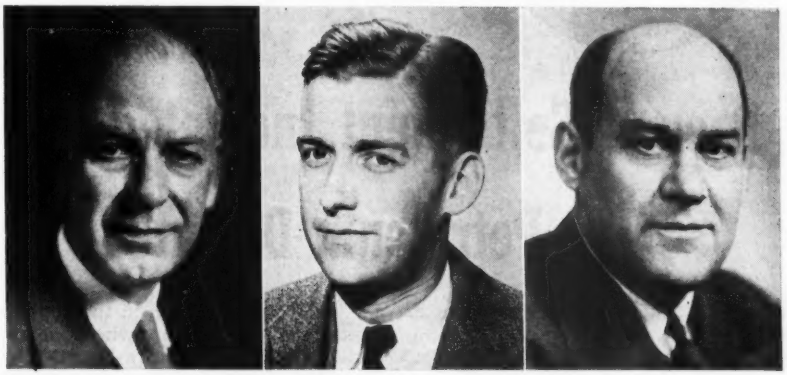
A proposal to increase casing thread standoff one turn was acted on favorably, subject to letter ballot. This change permits one more turn of makeup during the assembly of the couplings at the mill as well as in running pipe in the field.

Greater care will be required to develop this additional makeup without damaging the pipe or couplings either due to thread friction or crushing with tongs. Flattening, combined with notching, may cause serious reduction in bursting strength.

Coupling stresses due to makeup and internal pressure are additive according to analytical investigations, and with the added makeup and high pressures result in values which should not be disregarded in designing for increased tensile and burst requirements.

Higher internal test pressures are being requested by users and more definite values for maximum test requirements are required to permit proper design of testing equipment.

Higher-strength casing joints utilizing upsetting and various methods of treating to increase the strength are being developed.



Officials of the Mid-Continent district, A.P.I. Division of Production, who have been active in preparations for the group's spring meeting, include: R. C. Kay, Amarillo independent producer, chairman of the general arrangements committee; W. L. Horner, Barnsdall Oil Co., Tulsa, chairman of the program committee; and Lawrence R. Hagy, of the firm, Hagy, Harrington & Marsh, and mayor of Amarillo, chairman of the entertainment committee

Technical Program Planned in Amarillo

TECHNICAL sessions on coring and drilling, unit operations, and natural-gas production will feature the annual spring meeting of the Mid-Continent district, Division of Production of the American Petroleum Institute, to be held May 22-23 in the Herring Hotel, Amarillo, Tex.

Meeting of several committees of the organization will precede the opening of the general meeting to be held Wednesday, May 21, preceding the first general session on Thursday. Following is the tentative program:

Thursday, May 22

10 a.m.—General session. "State Cognizance of Federal Power," Don Emery, vice president and general counsel, Phillips Petroleum Co., Bartlesville, Okla.; "A Progressive Program on Public Relations for the Oil Industry," speaker to be announced.

1:30 a.m.—Gas session. "Productivity of Individual Zones Used for Determining Completion Efficiency, Hugoton Field, Kansas," R. B. LeFevre and Henry Schaefer, Stanolind Oil & Gas Co., Tulsa; "The Monroe Gas Field and Its Pressure Behavior," Don T. MacRoberts, United Gas Pipe Line Co., Shreveport, and Preston Fergus, Union Producing Co., Monroe, La.; "Development in the Carbon Black Industry," Ira Williams, director of research, J. M. Huber Corp., Borger Tex.

Friday, May 23

9:30 a.m.—Unit Operations session. "Unitization of Oil Fields in the United States," K. E. Beall, manager, economics department, Phillips Petroleum Co., Bartlesville, Okla.; "Results of Experimental Water Flooding in a Lime Reservoir Originally Under Dissolved Gas Drive," P. S. Ervin, Haynesville Operators Committee, Haynesville, La.

1:30 p.m.—Coring and Drilling session. "Developments in the Restored State Method for the Determination of Oil in Place and Connate Water," W. A. Bruce and H. J. Welge, Carter Oil Co., Tulsa; "Diamond Coring versus Conventional Methods of Penetrating the Weber Formation in Rangely Field," R. E. Pou, E. W. Olson, and C. G. Congdon, The Texas Co., Rangely, Colo.; "Modern Practices in Deep Contract Drilling," Jack H. Abernathy, Big Chief Drilling Co., Oklahoma City; and discussion on "Suggestions for Lowering Costs of Drilling Operations," Glen D. Hughes, Sun Oil Co., Tulsa.

New A.C.S. Group to Meet in Tulsa

The first meeting of the newly authorized Tulsa section of the American Chemical Society will be held at the Tulsa Building, Tulsa, Friday evening, May 23. George Roberts, Jr., manager of the research laboratory of Stanolind Oil & Gas Co., will speak on "The Synthol Process." C. O. Willson, editor of The Oil and Gas Journal, will speak on "Some Aspects of Our International Petroleum Situation." Buell O'Connor, Stanolind Oil & Gas Co., is chairman of the section.

International

WORLD-WIDE OIL DEVELOPMENTS

Prompt Settlement Indicated for Iraq Petroleum Dispute

WITH some speculation prevalent in international oil circles that the political victory of Paul Ramadier, French Socialist premier, might expedite an out-of-court settlement of the Cie. Francaise des Petroles suit against Standard Oil Co. (N. J.) and Socony-Vacuum Oil Co., Inc., an unusually well-informed source in New York this week indicated that "it might well help."

Another development that might well help is the fact that the French Government has been officially informed by the U. S. State Department that it considers current Middle East oil negotiations of a purely private and commercial character. In answering the French Government's protest, the U. S. State Department reportedly called attention to current London negotiations (about which it has been fully informed) and expressed the hope that mutual basis of agreement will be reached in the near future.

When these developments are coupled with the fact that the World Bank, in which the U. S. Government plays a leading role, has commenced operations to loan France $250,000,000, the general outlook for a prompt settlement of the oil dispute is regarded favorably.

One of the stumbling blocks in the Cie. Francaise (35 per cent owned by the French Government) dispute over the legality of Iraq Petroleum Co., Ltd.'s "Red Line Agreement," reportedly has been to what type of government would the Cie. Francaise representative have to report to at the termination of negotiations. That is, it was said that the Cie. Francaise representative would be in a better negotiating position once he knew "which way the political wind was blowing in Paris."

The presence of Communist members in the French Cabinet may or may not have resulted in a delaying action. But with the Communists at last rejected, there have been notable sighs of relief, both in the United States and in London where negotiations to settle the intra-Iraq Petroleum Co. dispute are still in progress.

When the dispute is settled, Jersey Standard and Socony-Vacuum will complete negotiations to become stockholders—30 per cent and 10 per cent, respectively—of Arabian American Oil Co. Pending this settlement the companies involved announced a financial working agreement last month. *(The Oil and Gas Journal, April 19, page 68).*

French Fear Crude Shortage

Meanwhile, reports from Cie. Francaise des Raffinage, 51 per cent owned by the French Government and a subsidiary of Cie. Francaise des Petroles, reveal evidence of what reportedly has been a major fear of some French oil men since it became known that one of the I.P.C. partners (Near East Development Corp.—jointly owned by Jersey Standard and Socony-Vacuum) contemplated, as individual companies, becoming stockholders in Arabian American.

The ostensible fear, on the part of the French, has been over a possible lack of crude oil for the ever-expanding French refining industry—and this notwithstanding the increased amount of crude which will accrue to Cie. Francaise on completion of Iraq Petroleum's additional pipe-line capacity from Kirkuk, Iraq, to the Mediterranean. Currently, United States crude sources, which accounted for 8 per cent of the French crude imports last year, have informed Cie. Francaise des Raffinage that no definite commitments will be made beyond 1947.

During the second half of this year, approximately 130,800 bbl. of crude oil and 42,200 bbl. daily of finished products will be imported into France. Of this total, about 19,000 bbl. daily of crude oil will come from Iraq for Cie. Francaise and about 16,000 bbl. daily will continue to be purchased from Pantepec Oil Co. in Venezuela. The remaining 95,800 bbl. will be imported from the United States and Middle East areas other than Iraq.

Natural-Gas Development Under Way in Poland

NATURAL-GAS production in Poland's Sadkowa-Roztoki and Strachocina fields totaled 117,085,000 cu. m. in 1946, of which 11,854,000 cu. m. were produced in December, according to the Foreign Commerce Weekly of the U. S. Department of Commerce. (One cubic meter equals 35.3 cu. ft.)

Daszawa field, formerly in Poland and now within the Russian area, supplied 83,097,000 cu. m. Total natural gas fed into pipe lines from the three fields last year was 200,182,000 cu. m. An extension of the pipe line to Zabrze is now reportedly under construction.

An exploratory well in Debowiec, southwest of Oswiecim, was completed in the winter of 1946 at a depth of 397 m. (about 1,270 ft.) and showed an initial production of 97.5 cu. m. of gas. Geologists believe that more important reserves lie at deeper levels in this area.

Crude-oil production in Poland, which was at the daily rate of approximately 24,000 bbl. before the war, dropped to around 2,500 in 1945. The Polish oil industry is now under national control.

Under the government's 3-year plan for economic development, it is hoped to develop a large part of the probable oil reserves in the Cracow area. Relatively small production is now being obtained from existing wells here, according to a recent Reuters dispatch from Warsaw. The 3-year plan provides for drilling a total of 600,000 ft.

Shell Company Conducting Queensland Exploration

Approximately 1,000,000 British pounds may be spent by Shell (Queensland) Development Co. on exploration surveys in Australia's

Queensland, according to Dr. C. W. Creek, chief geologist. To date about 250,000 pounds have been spent there on exploratory activities.

Certain geophysical operations also have been carried out. Plans for a 12,000-ft. test are now under way in Roma, Queensland, where Shell has exclusive concession rights on a 3,100-sq. mile area.

Shell has been authorized by the Commonwealth Government to buy approximately $2,152,000 worth of oil equipment from the United States. This is equipment which cannot be obtained either in Australia or Great Britain.

Venezuela Continues As Major French Supplier

France imported approximately 78,130 bbl. daily of crude oil during the first quarter of 1947, according to a recent Reuters dispatch from Paris, quoting official government sources. Of this amount, Venezuela was the chief supplier with 352,043 tons. (about 29,728 bbl.), while the United States supplied 102,520 tons (about 8,657 bbl. daily).

During March, France imported 323,131 tons of crude, or about 71,859 bbl. daily, compared with 226,346 tons in February, or about 61,436 bbl. daily.

The United States was the only supplier of fuel oils during the first quarter of this year, with 945 tons, or about 79 bbl. daily. Gasoline imports for the same 3-month period totaled 230,911 tons, or about 19,499 bbl. daily. Of this total, 101,741 tons (about 8,591 bbl. daily) came from the United States.

Plans are under way to expand the French tanker fleet to a monthly capacity of around 3,500,000 bbl. Currently, French hulls carry about 1,160,000 bbl. monthly.

I. P. C. Studies Use of Airborne Magnetometer

The possibility of using the airborne magnetometer on some of Iraq Petroleum Co., Ltd.'s Middle East concessions are now being studied.

In connection with I.P.C.'s exploration work, it was learned drilling activities of some of this company's associates this spring will include tests in Tripoli, Syria, Qatar, and the Basrah concession in southern Iraq. Previous tests in Syria have proved to be dry holes.

The three producing wells in Qatar, plugged during the war, will be impossible to recondition, according to a well-informed source. Consequently, adjoining sites will be selected and the costly project resumed shortly. Seismic surveys are being planned on the island of Cyprus this summer.

Decline Predicted for Austrian Production

AUSTRIA'S crude-oil production in 1946 totaled approximately 846,000 tons, or around 16,000 bbl. daily, compared with 454,000 tons, or around 8,700 bbl. daily in 1945, according to the Foreign Commerce Weekly of the U. S. Department of Commerce which explains that 1944's output reached 1,213,000 tons, or around 23,000 bbl. daily when the Nazis were producing the wells at the maximum.

In the spring of 1945, production was suspended in eastern Austria. Shortly after Germany's surrender, the Russians seized about 50,000 tons of oil-field equipment, leaving behind only a bare minimum of replacement parts. As a consequence of this action, combined with Austria's inability to purchase equipment abroad, it is currently impossible to drill new wells or to rehabilitate existing wells many of which are clogged with sand and wax.

Production this year, the report stated, is therefore expected to drop lower than in 1946 and will continue to decline until it is insufficient to meet Austrian consumption requirements—unless important new fields are discovered in the meantime.

In 1937, Austria consumed 350,000 tons (about 6,700 bbl. daily) of which 150,000 tons (about 2,800 bbl. daily) were gasoline. Fuel-oil requirements have increased greatly since.

Austria's crude-oil production is still in the hands of the Russians, although they have made some token payments to foreign oil interests which own certain Austrian oil properties. *(The Oil and Gas Journal, March 29, page 65, and March 8, page 41.)*

Last year, 321,000 tons (about 6,100 bbl. daily) were released by the Russians for Austria's domestic needs, the balance having been exported or used by Soviet forces.

The Russians claim as reparations 72 per cent of Austria's crude-oil production properties, and about 50 per cent of the refining capacity, which The Oil and Gas Journal's "Survey of World Oil Refineries," last December showed as being about 8,770 bbl. daily. Moreover, the Soviets are also claiming virtually 100 per cent of areas where the development of oil fields is thought to be favorable.

Y.P.F.B. Moving U.S. Offices

United States offices of Yacimientos Petroliferos Fiscales Bolivianos (Bolivian Government Oil Fields) have been moved from New York to Dallas. A. J. Machicao, representative, said that until an office is established there, correspondence should be addressed in care of the Mercantile National Bank, Dallas.

International

New York Court Passes On Creole Settlement

NEW YORK.—The New York Supreme Court early this week approved a settlement in a suit by stockholders of Creole Petroleum Corp. whereby 750,000 shares have been returned to Standard Oil Co. (N. J.).

Minority stockholders had questioned the ratio of appraised values of the assets of Creole and Lago Oil & Transport Co., Ltd., in consolidating their Venezuelan operations in 1943 and also had questioned prices at which Creole crude was sold before Creole's purchase of Lago's Venezuelan assets.

Petroleum Development To Explore Trans-Jordan

Petroleum Development (Trans-Jordan), Ltd., subsidiary of Iraq Petroleum Co., early this week was reported to have been granted a 75-year exploration and development concession covering all of Trans-Jordan.

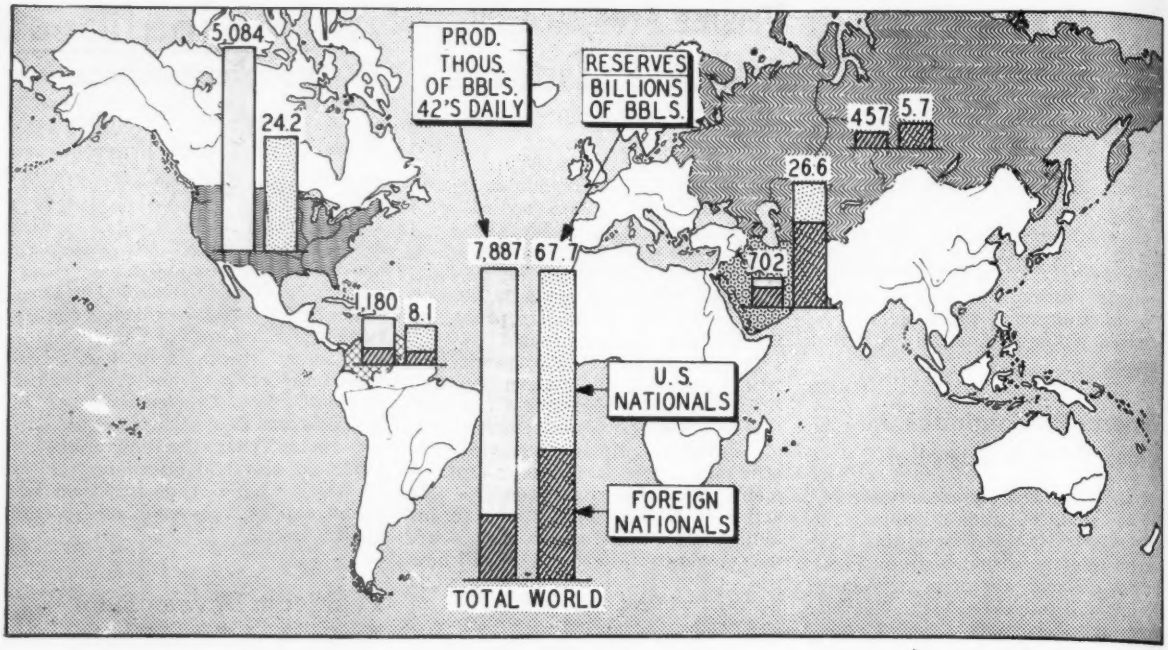
According to reports, the company paid $200,000 for the concession and agreed to drill its first well within 18 months. If oil is discovered, royalty payments will be substituted for rent, which was set at $60,000 annually for the first 3 years, $100,000 for the second 3 years, and a gradual increase to $320,000 annually within 15 years. The agreement provides that oil may be exported through Palestine via a proposed pipe line, possibly to Haifa.

Pipe Shipments Scheduled For Bolivian Project

Pipe for the Camiri-Tin-Tin pipe line contracted by Williams Brothers Co. for the Bolivian Government is scheduled for shipment in large amounts going from the United States via Santa Fe, Argentina, where it is forwarded by railroad to Bolivia. Consideration is being given to authorizing an extension of the line from Tin-Tin to Cochabamba. Some of the pipe is reported in transit at the present time.

Mexico Applies for Loan

For the development of varied productive facilities, including pipe lines, the Government of Mexico has made formal application for a loan of $208,875,000 to the International Bank of Reconstruction and Development.



This map illustrates the relationship between world production and reserves and indicates the portion of world reserves controlled by American nationals

Petroleum-Supply Problem Is World Wide; Nearby Markets to Take Middle East Oil

by L. F. McCollum

IT seems to me that, to put the whole question of oil reserves for the future in proper perspective, we should examine the implications implicit in the comparison between potential oil possibilities in the United States and the rest of the world.

Actual figures, I know, are open to question, but every geologist recognizes the basis for all of our guesses—the sedimentary areas of the world. In the United States we have about one-sixth of the world's sedimentary basin area. Yet the total of our produced crude oil and proved reserves is in the order of half of our total potential resources, while in the rest of the world we have only scratched the surface with a little more than one-tenth of the potential resources produced or proved. . .

Outside of the United States in the Western Hemisphere, discoveries of major importance are expected to be made in the countries fringing the Caribbean. It would not be unreasonable to expect that this area will find enough oil to produce at the rate of approximately 1,500,000 bbl. daily in the foreseeable future.

Another region of great potentiality lies east of the Andes Mountains in Colombia, Ecuador, and Peru, larger in areal extent than the combined states of Texas and Oklahoma. This region is completely isolated by mountains and jungles from the nearest suitable sea terminals and therefore will be extremely expensive to develop. It would require tremendous investments in pipe lines in addition to the great expenditures for exploration and development. For instance, it has been estimated that to develop production of 150,000 bbl. daily east of the Andes in Colombia alone would require an approximate expenditure of $250,000,000 to $300,000,000 before the first barrel of this oil would reach commercial markets. Similarly, it has been estimated that to develop 300,000 bbl. per day production in the Montana region of Eastern Peru would require an investment of $450,000,000 in exploration, development, and pipe-line investments. These are about the minimum expenditures that the industry should be prepared to spend to start development of these two areas.

In the Eastern Hemisphere (outside of Russia) there are two main re-

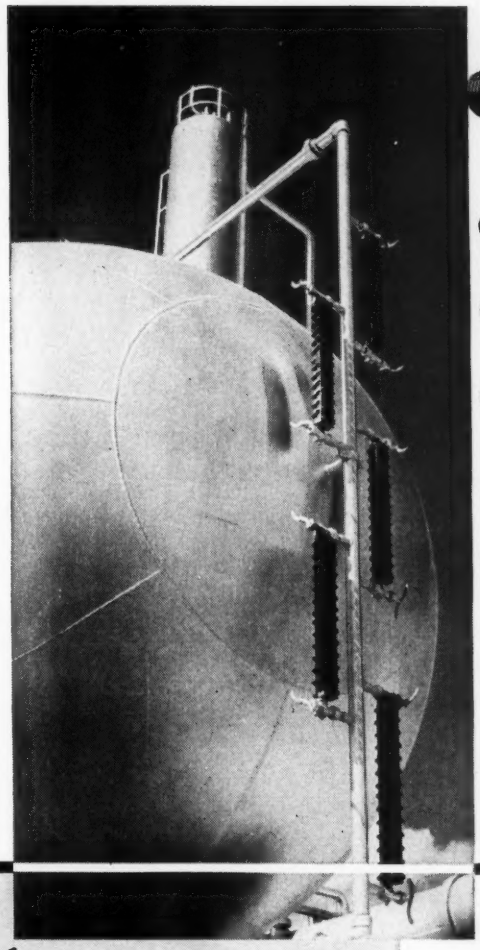
This is an abridged version of the paper, "Foreign Oil—Developments, Operations, and Supply," which was given by L. F. McCollum at the forum on "Foreign Oil" May 9 at the midyear meeting of the directors of the Independent Petroleum Association of America in Jackson, Miss. A report on the I.P.A.A. meeting appears on page 55. McCollum is coordinator of producing activities for Standard Oil Co. (N.J.) A native of Tennessee, he was educated in Texas, receiving a bachelor of science degree in geology from the University of Texas in 1925. Joining Humble Oil & Refining Co. as a scout, he held positions of increasing importance in the organization and in 1934 joined Carter Oil Co., another Jersey affiliate. He became president of Carter in 1941 and in 1943 resigned this post to assume duties as a vice president of the Jersey company in New York.

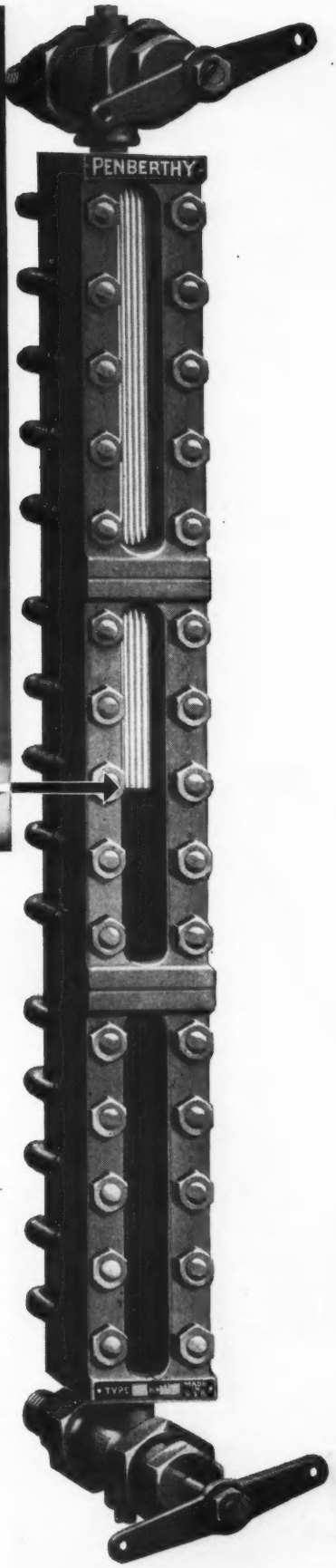
WHEN YOU MUST

BE SURE

OF THE

LIQUID LEVEL





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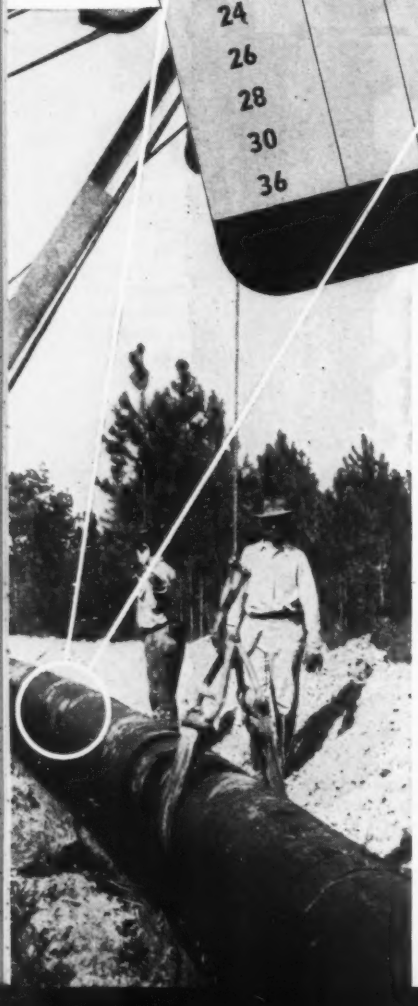
Pipe O.D. Inches	WALL THICKNESS .109	.141	.172	.188	.219	.250	.281	.312	.375	.438	.500
6	x	S	S	S	x						
6 5/8	x	x	x			x	x				
8	x	S	S	S	x						
8 5/8	x	x	x			x	S	*x			
10	x	S	S	S	x				x		
10 3/4	x	x	x			x	S	x	x	S	
12	x	S	S	S	S	x	S	x	x	S	x
12 3/4	x	x	x			x	S	x	x	S	x
14		x	x	x	S	x	S	x	x	x	x
16		x	x			x	S	x	x	S	x
18			x	x	S	x	x	x	x	x	x
20						S	x	x	x	x	x
22						x	x	x	x	x	x
24						x	x	x	x	x	x
26						x		x	x	x	
28											
30											
36											

*—10 3/4" OD is furnished in .279", not .281".
S—Indicates standard inventory sizes.
x—Indicates these sizes available in minimum quantities of 10,000 lbs.



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ARMCO SPIRAL WELDED PIPE

gions which hold potentialities for finding new crude supplies. Of these, the Middle East is of course the most important one—not only in the Eastern Hemisphere but in the entire world. The potential producing area of the Middle East is only half as large as the potential producing area of the entire United States, but very little exploration has been done; already known are many large untested structures. Its potential oil is in the order of half again as much as compared with the United States. The second area of major account in the Eastern Hemisphere are the islands of Oceania. They are expected to grow in importance but not in the same order of magnitude as the Middle East and Russia.

Russia has been excluded from most of this discussion because this country is as much of an enigma for oil men as it is to others. However, we do feel that, from geological evidence, Russia should have many times as much oil within its own borders as it can use. Russia's geology indicates that it should become one of the most prolific oil-bearing regions in the world. . .

These total world reserves (Table 1) now proved, are more than adequate to meet the total demand—the problem of supplying that demand involves equipment, capital, manpower, management, and time, particularly time.

Worldwide Oil Production

The second set of facts we need in analyzing our common problem, are the actual production figures from these reserves. As you know, for years the United States has supplied over 60 per cent of the world's production. Right now the Western Hemisphere is called upon to supply approximately 82 per cent of the total (Table 1).

Producing Conditions in Foreign Fields

Venezuela, of course, with 90 per cent of the production there, is the dominating country in the Caribbean. American interests own rights to approximately 70 per cent of the reserves in Venezuela and during 1946 accounted for 67 per cent of the production. The area produced 1,184,000 bbl. of crude oil daily during 1946, and of this total 350,000 bbl. were imported into the United States.

Most of the fields in Venezuela produce from sand reservoirs of Tertiary age ranging in depth from 3,000 to 9,500 ft., the only important exception being the limestone production of Cretaceous age discovered by Shell west of Lake Maracaibo in 1944. The bulk of the drilling is in medium to hard formations and the bulk of today's production comes from less than 5,000 ft. These fields, with a few exceptions, are developed on wide spacing and are produced at not to exceed the maximum efficient rates, which are somewhat lower than the United States on a field basis. At its current rate of 1,174,000 bbl. daily, Venezuela produces only 5.7 per cent of its proved reserves annually, compared with the 8 per cent annual rate in the United States. We believe that Venezuela has sufficient reserves already proved to increase its efficient producing rate to 1,250,000 bbl. daily, which would be equivalent to a rate of 6 per cent of its reserves annually, or 2 per cent below the United States rate.

The Middle East producing countries include Iraq, Iran, Kuwait, Saudi Arabia, Qatar and Bahrein Island. American interests own rights to approximately 30 per cent of Middle East reserves, and during 1946 produced 30 per cent of the production. This area produced 702,000 bbl. daily in 1946, and of this total, one cargo of crude was imported into the United States from Kuwait, for refinery tests. In 1947 the Middle East will probably contribute to the world's crude oil production at the rate of 806,000 bbl. daily, as follows: Iran, 410,000 bbl.; Iraq, 96,000 bbl.; Arabia, 240,000 bbl.; Bahrein, 20,000 bbl.; and Kuwait, 40,000 bbl.

The outstanding characteristic of the area is that all of the producing fields are very large. Everything in the Middle East is unusual by our standards. Distances are great, temperatures are extreme, the terrain ranges from desert with great sand dunes to rugged mountains, the oil bearing structures are huge, and the oil wells are big. Like most other foreign operations, the companies must provide almost everything for the comfort and welfare of the employes, as well as all the materials to develop the oil fields.

Reserves Predominantly Limestone

Oil reservoirs of the Middle East are predominantly limestone, the major exception being Kuwait with a sand producing reservoir. Practically all drilling is in hard formations, with depths ranging from about 3,000 to 7,000 ft. The limestone reservoirs are a combination of fractured and porous reservoirs, with the result that wells are extremely large. The size of the wells, at least in some of the fields, is limited more by the size of the casing than by ability of the formation to produce efficiently. It is not unusual for a well to produce on test 15,000 bbl. daily with a bottom-hole pressure differential of only 10 psi.

Operations in the Middle East, from a reservoir-engineering standpoint, are among the most efficient anywhere in the world. Anglo-Iranian, the first operator in this area, learned its lesson in reservoir control early

TABLE 1—WORLD OIL PRODUCTION AND RESERVES

	1946 Prod. (1,000 bbl. daily)	Reserves Jan. 1, 1947 (Millions of bbl.)
Crude oil—		
Western Hemisphere:		
United States	4,749	20,900
Caribbean Area:		
Venezuela	1,064	7,500
Trinidad	55	200
Colombia	61	400
Total	1,180	8,100
Balance, W. Hemisphere:		
Mexico	135	600
Argentina	57	200
Peru	34	200
Canada	20	100
Others	8	50
Total	254	1,150
Total Foreign West. Hemisphere	1,434	9,250
Total W. Hemisphere	6,183	30,150
East. Hemisphere:		
Europe (exc. Russia) and Africa:		
Roumania	86	500
Other Europe, Egypt	76	150
Total	162	650
Middle East:		
Iran	402	9,500
Saudi Arabia	165	5,000
Iraq	97	7,500
Bahrein	22	300
Kuwait	16	4,000
Qatar	....	300
Total	702	26,600
Far East:		
N.E.I.	25	800
British Borneo	10	200
Burma	1	100
India, Japan, China	13	100
Netherlands New Guinea	....	100
Total	49	1,300
Russia and Sakhalin	457	5,700
Total E. Hemisphere	1,370	34,250
Total Foreign	2,804	40,200
Total World	7,553	64,400
Natural Gasoline and Condensates, etc.:		
United States	321	3,300
Bal. of W. Hemisphere	11	....
E. Hemis. (Ex. Russia)	51	....
Total	383	3,300
Total World Petroleum	7,936	67,700

TABLE 2—ESTIMATED AVAILABILITY OF PETROLEUM SUPPLIES
(Thousands of barrels daily)

Western Hemisphere

	Actual 1946	Estimated 1947	Estimated 1951
United States:			
Crude oil	4,749	4,914	5,166
Others*	321	340	410
Total	5,070	5,254	5,576
Caribbean area, crude	1,180	1,293	1,539
Balance, Western Hemisphere crude	254	262	342
Western Hemisphere (exc. U. S.)—others*	11	10	15
Total	6,515	6,819	7,472

Eastern Hemisphere (Exc. Russia)

Europe, Africa, crude	162	160	160
Middle East crude	702	806	1,487
Far East crude	49	56	256
Eastern Hemisphere, others*	51	54	54
Total (Exc. Russia)	964	1,076	1,957
Total world supply (exc. Russia)	7,479	7,895	9,429

*Includes natural gasoline, condensates, synthetics.

Let's

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take a look at the FACTS

Since the close of the war . . . VJ Day . . . 25 Fluid Catalytic Cracking Units ranging in capacities of from 3,000 to 40,000 bbls. have been placed in operation, or are under construction. When completed, these units will have a total capacity of over 400,000 barrels per stream day.

These facts and figures provide overwhelming evidence of a definite trend toward Fluid Catalytic Cracking . . . a rapidly increasing preference, on the part of progressive refiners, for this highly flexible process.

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in the history of the Middle East when it pulled water more than 400 ft. into the oil column in their Masjid-l-Suliman field almost overnight. The company undertook a thorough study of the field to learn the behavior of oil in limestone reservoirs, which led to the development of precise reservoir control. Today withdrawals are carefully balanced to give a uniform rise in water level and fall in gas level over the entire structure. The success achieved by Anglo-Iranian in applying reservoir control to this field is best illustrated by the field's actual production record 20 years after the water invaded it. It has produced to date approximately 800,000,000 bbl. and is still producing in the neighborhood of 70,000 bbl. daily.

The large well production rates in the Middle East could not be maintained for long if careful reservoir control were not exercised and the production of fields were not restricted to the ability of reservoirs to produce efficiently.

A typical example of development is Kirkuk field in Iraq, which now produces about 90,000 bbl. daily. During the development of the field, some 50 wells were drilled, but only 16 are used for production. The remainder are considered necessary to observe reservoir behavior. Ten of the nonproducing wells are used solely to gage the rise in oil water level at various points on the structure; eight are used to observe the pressure at various points; and two are used to record the gas-oil level. The remaining 14 wells were required to determine the size and shape of the structure. The field is about 60 miles long and 2¼ miles wide. Obviously, the well spacing is very wide.

Reserves in the field are in the neighborhood of 7½ billion barrels, hence the present rate of production is far below the efficient producing rate. The current view is that the field could produce 500,000 bbl. a day efficiently, or 2.4 per cent of its reserves annually. An increase in production over the present rate would, of course, require additional wells both for production and observation of reservoir behavior.

Based on past experience in the older fields of Iran where the maximum annual producing rate in any field has never exceeded 4 per cent of original reserves, and based on estimates for Kirkuk field which indicates its optimum annual producing rate to be less than 3 per cent of original reserves, it is reasonable to expect that average annual production from all Middle East fields probably will not exceed 3.5 per cent of reserves.

The productive capacity of the Middle East is expected to increase, upon completion of the contemplated pipe lines, to about 1,500,000 bbl. a day by the end of 1951. Iraq's 16-in. pipe line is estimated to go into partial service in the first half of 1949 and the second line, not yet finally determined, some time thereafter. Arabian American's 30-32-in. pipe line is scheduled to start in the first half of 1950; and the 30-32-in. line from Iran and Kuwait may be ready by the middle of 1951. Big as they are, these pipe lines are being constructed merely to meet the rising needs of refineries and the demand for crude and its products in the markets adjacent and tributary to these fields.

In order to complete the picture of major foreign producing areas of the world outside of Russia, some mention should be made of the islands of Oceania. The principal productive areas include the islands of Sumatra, Java, Borneo, and New Guinea. Prior to the war, these islands produced 180,000 bbl. a day but the present yield is only 35,000 bbl. a day. The reason for this low producing rate is that the companies have not yet been able to return to the producing fields in Sumatra and Java because of the unsettled political conditions.

The Far East has proved reserves of 1.3 billion barrels which could easily produce 180,000 bbl. daily, equivalent to 5 per cent of its reserves annually. The present condition of wells and facilities in most of the fields is unknown, and it is believed that several at least will be required to rebuild Far East production to the prewar rate, the rate needed to meet the demand for oil in the Far East.

Import Economics

For many years, of course, the United States, the world's largest producer and exporter, has been the major factor in determining crude-oil prices world-wide. Quite probably, before many years, other world supply sources will develop their own price structures.

You may be interested in a few comparative figures showing the price an East Coast refiner could afford to pay at the well for foreign oil, related to similar United States crudes at New York at present postings. These prices quite naturally depend upon the gravity and quality of the crude.

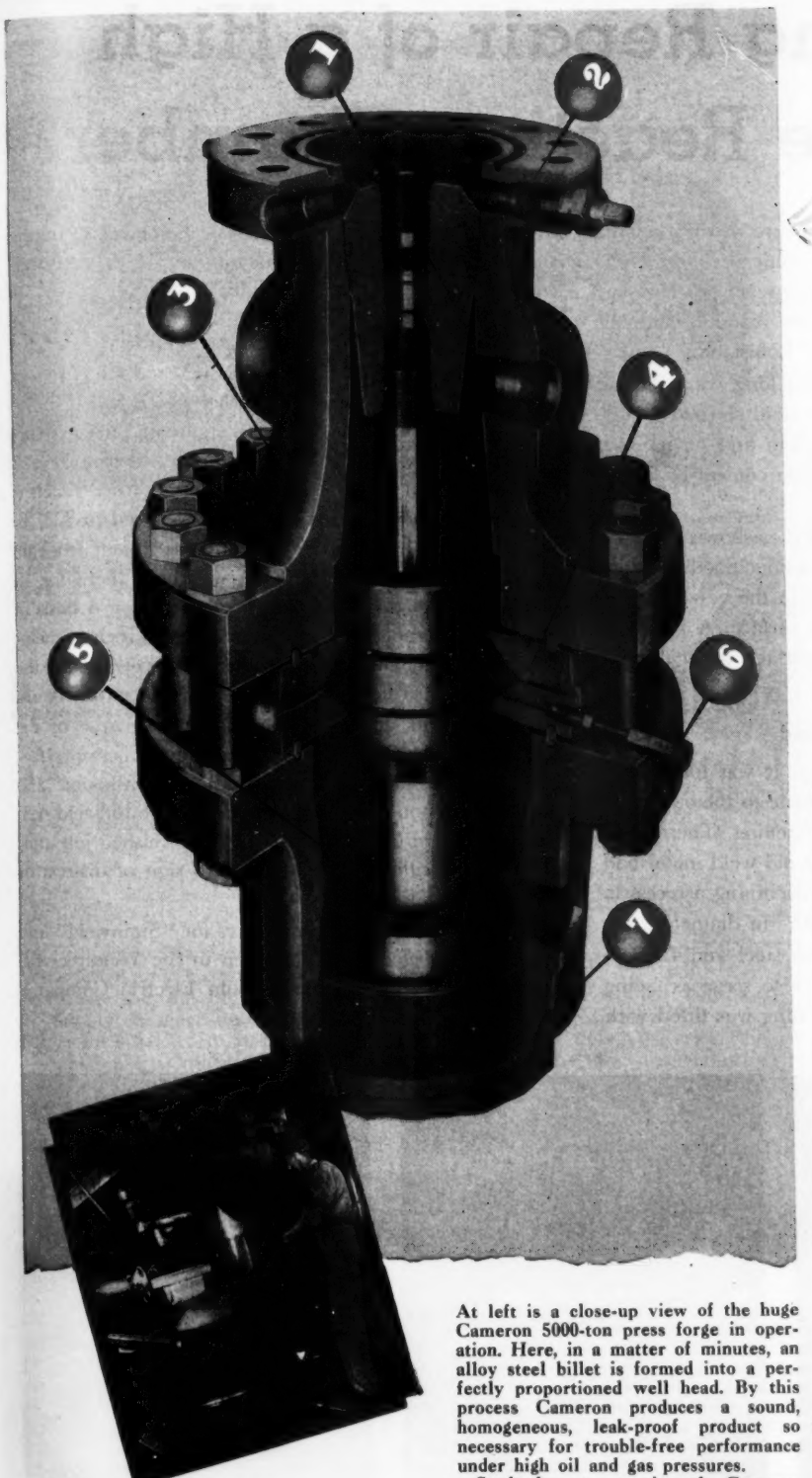
In Venezuela, there is a wide gravity range from about 14° A.P.I. at Bachaquero to 49° A.P.I. at Cumarebo. A very substantial part of Venezuelan production is in the heavy and medium gravity range below 30° A.P.I. On the basis of the present well

(Continued on page 148)

PITTSBURGH GEOLOGICAL SOCIETY HOLDS ORDOVICIAN SYMPOSIUM

J. T. GALEY *DR. E. T. HECK* *DR. C. R. FETTKE* *R. C. LAFFERTY* *A. C. McFARLAN*

Ten papers on the Trenton and Sub-Trenton are being presented at a 1-day Ordovician Symposium at Pittsburgh, May 16, under the auspices of the Pittsburgh Geological Society, with H. R. Brankstone, president of the local society, making the address of welcome. A large attendance by eastern geologists is indicated from preliminary registrations. Among the speakers are J. T. Galey, independent operator, Pittsburgh; Dr. E. T. Heck, chief geologist, Quaker State Oil Refining Corp., Bradford; Dr. C. R. Fettke, professor of geology, Carnegie Institute of Technology, Pittsburgh; R. C. Lafferty, consulting geologist, Charleston, W. Va., and A. C. McFarlan, head, department of geology, University of Kentucky, Frankfort



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CAMERON *Forged Steel*

1. Type "F" *Forged Steel* Tubing Head, utilizing the proven lock-screw design.
2. Three interchangeable tubing hangers available: regular boll-weevil, regular boll-weevil threaded to receive back pressure valve, and polished joint type with hanger flange.
3. *Forged* alloy steel body.
4. Type "YT" Seal Flange—tightening flange studs brings resilient seal ring into sealing engagement with casing.
5. Hydraulic seal test port optional.
6. Improved forged steel slips in six segments contained in a two-piece cage for easy assembly around pipe.
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At left is a close-up view of the huge Cameron 5000-ton press forge in operation. Here, in a matter of minutes, an alloy steel billet is formed into a perfectly proportioned well head. By this process Cameron produces a sound, homogeneous, leak-proof product so necessary for trouble-free performance under high oil and gas pressures.

Study the cut-away view of a Cameron Type "F" Casing Head-Tubing Head assembly presented above. Note the thick body wall sections and the compact design of the assembly. Then read the summary of its mechanical features presented at right.

Here is a real advancement in well heads . . . highest quality *forged Alloy steel*, economically priced for the 4000-6000 lb. test pressure field.

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Welding Repair of a High Pressure Reaction Chamber

OIL refineries today make many arc welding repairs themselves that they formerly sent to a fabricator's welding shop. An example of this progress was the repair of a high pressure, high temperature reaction chamber at a large refinery in Baton Rouge, Louisiana.

The vessel, 6 ft. in diameter by 40 ft. long, was a forging of seamless carbon steel with conical shaped heads, manhead openings at top and bottom and no internal equipment. The nozzle in the bottom conical head was corroded and had to be renewed.

Originally this nozzle was installed as shown in Fig. 1 by inserting a forged nipple, with a machined shoulder on one end, through a drilled hole in the vessel wall so that the shoulder fitted the inside surface. A retaining ring nut was placed on the outside surface and seal welds made inside and outside.

Cracks Discovered

After burning out the old nozzle, it was found that previous welded repairs had been made to the outside of the vessel wall around the nozzle opening. There were numerous cracks in this area, so the old weld metal had to be removed. This was done by machining a recess in the outside surface 2⅞" deep and 15" in diameter.

The recess was filled with carbon steel and Lincoln "Stainweld A7" electrode, the latter to serve as facing for the ring groove. The nozzle opening was fitted with an 18-8 chrome nickel stainless steel liner. Use of the stainless steel liner and weld metal guards against future corrosion. Fig. 2 shows the welded boss.

Preheated and Stress-Relieved

For satisfactory welding, preheating and stress relieving was necessary. A gas ring burner was installed in the bottom manhead and a damper installed in the top manhead. Temperature was controlled with a thermocouple. Welding began when the metal temperature reached 400° F. and continued as it was slowly raised to 725° F.

To stress relieve, the temperature was raised, at a rate of 30° per hour, to 1050° F. It was held there for 10 hours' soaking, this time being calculated on a basis of holding the temperature one hour for each inch of metal thickness at the point of repair. Then it was lowered at the rate of 27° F. per hour to 325° and the burner turned out.

Welding was done continuously and because of the intense heat it was necessary to change operators frequently. The job took 121 welding man-hours. 250 pounds of carbon steel and 100 pounds of "Stainweld A7" electrodes were used. Fig. 3 shows the finished job after machining, drilling and tapping. No sign of distress or cracking has appeared.

Complete details and procedures for "Stainweld" and other Lincoln electrodes are given in the Weldirectory. Free on request from The Lincoln Electric Company, Dept. 205, Cleveland 1, Ohio.

Fig. 1—Original installation of the nozzle showing retaining ring and seal welds.

Fig. 2—The welded boss. Note line of demarcation between carbon steel and "Stainweld" deposit.

Fig. 3—Finished boss after machining, drilling and tapping operations.

Advertisement

P.I.E.A. officers, left to right, are D. H. Levy, superintendent of communications for Magnolia Pipe Line Co., Dallas, vice president; R. C. Appling, superintendent of communications for United Gas Pipe Line Co., Shreveport, secretary-treasurer; J. F. Collerain, superintendent, Houston Pipe Line Co., president; and M. C. Callahan, head of communications for the Tulsa division of Gulf Oil Corp., retiring president

P.I.E.A., P.E.S.A. Houston Meeting Draws Record Attendance

by E. H. Short, Jr.

HOUSTON.—The 3-day session of the Petroleum Industry Electrical Association and the Petroleum Electric Supply Association ended here May 8 with a record attendance of over 300 representatives from all parts of the country. Before the meeting convened, Dallas was selected for the twentieth annual conference which will be held next year during April.

The conference opened Tuesday, and after a brief period of organizational procedure, delegates spent the remainder of the day inspecting a large array of exhibits set up on the mezzanine floor of the Rice Hotel.

The program of the P.I.E.A. was opened Wednesday morning by President M. C. Callahan, who was followed by Fred Cummings, president of the P.E.S.A. Wednesday afternoon R. J. White, Philco Radio Corp., discussed "Two-Way Radio for the Petroleum Industry."

"The XY Switch" was discussed by M. A. Clay, Stromberg-Carlson Co., Kansas City, Kans. F. W. Littell of Shell Pipe Line Corp., Houston, chairman of the P.I.E.A. radio committee discussed "Petroleum - Industry Radio."

The Thursday session was highlighted by a talk by Gordon Volkenant, associate director of research, Minneapolis - Honeywell Regulator Co., Minneapolis. Volkenant demonstrated the simplicity of the electronic tube with a glass bottle, a tin can, a bent hairpin, and a piece of window screen and debunked the idea that there is anything complicated or mysterious about electronics. "Electronics," he said, "is just another method of automatic control."

Other speakers during this session were: F. R. Benedict of Pittsburgh, manager of Westinghouse Electric Corp.; G. L. Oscarson of Minneapolis, chief application engineer for Electric Machinery Manufacturing Co.; W. H. Stueve of Oklahoma Gas & Electric Co., Oklahoma City, and Hugh M. Stewart, chief electrical engineer, Humble Oil & Refining Co., Baytown.

Officers of P.E.S.A. are, left to right, R. H. Breese, General Cable Corp., Dallas, secretary-treasurer; Fred Cummings, manager, Graybar Electric Co., Tulsa, past president; E. C. Lyle, sales engineer, Westinghouse Electric Corp., Houston, president; and Claude A. Heiser, engineer, Anaconda Wire & Cable Co., Dallas, vice president

More Officials Named to Public Relations Posts

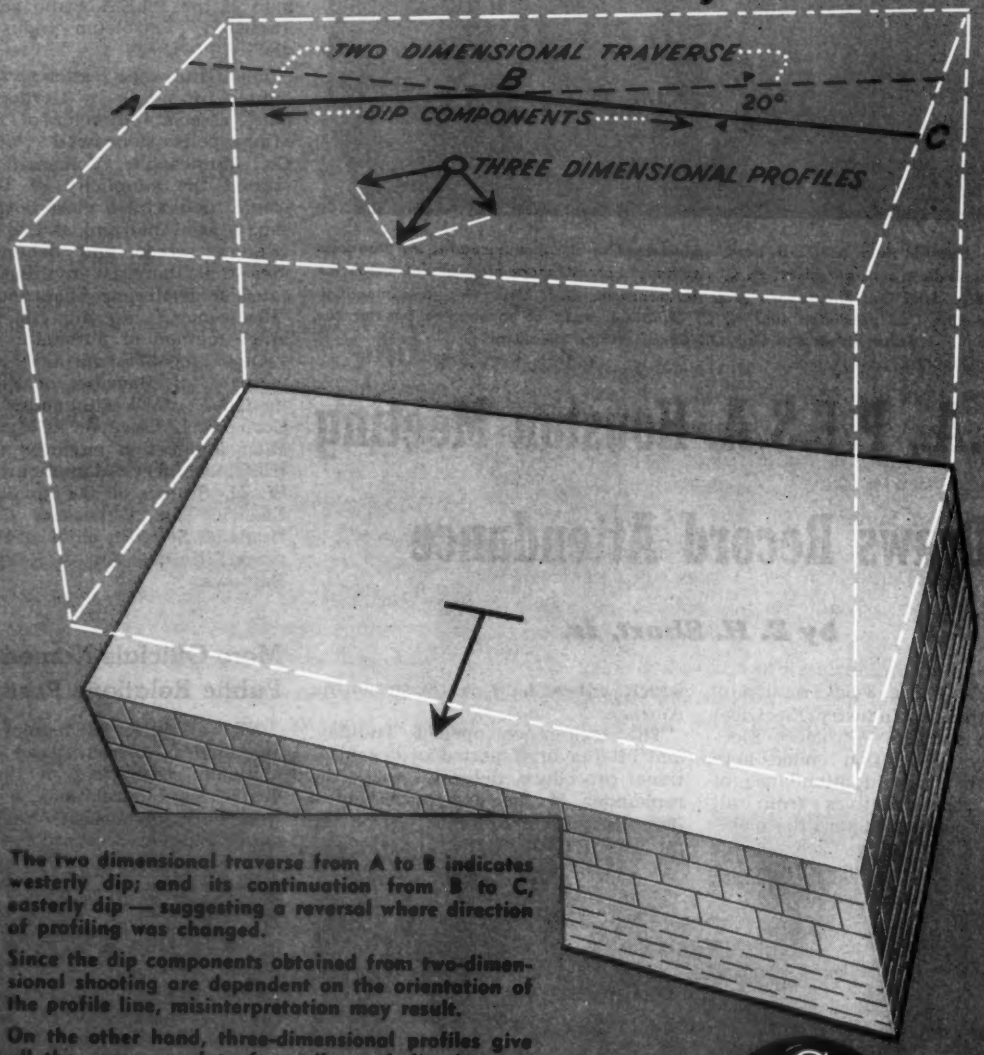
NEW YORK.—Schedules for 29 meetings of district, area, state, and sectional committees of the oil industry's public-relations program were outlined here by the industry's public-relations operating committee in its May meeting.

Charles Simons, Dallas, vice president and general manager of Texas Mid-Continent Oil and Gas Association, was elected to the operating committee to replace North Bigbee, who, until his resignation, was public-relations director of the association and a vice chairman of the operating committee.

In Denver, M. H. Robineau, Frontier Refining Co., was elected chairman of the Rocky Mountain district committee and Louis G. Wilke, Phillips Petroleum Co., Denver, was named vice chairman.

Newly elected state chairmen include Roland Rodman, Bay Petroleum Co., Colorado; J. D. Mabee, Chief Oil Corp., Wyoming; K. W. Yeates, president, Wasatch Oil Refining Co., Utah; Branson Stevenson, Socony-Vacuum Oil Co., Inc., Montana; C. J. Westcott, Westcott Oil Co., Idaho; and Eric V. Weber, president, Ohio Petroleum Marketers Association, Ohio.

Why 3 Dimensional Shooting is Necessary



The two dimensional traverse from A to B indicates westerly dip; and its continuation from B to C, easterly dip — suggesting a reversal where direction of profiling was changed.

Since the dip components obtained from two-dimensional shooting are dependent on the orientation of the profile line, misinterpretation may result.

On the other hand, three-dimensional profiles give all the necessary data for strike and dip determination.

SSC's three dimensional techniques provide the basis for ACCURATE REVEALING OF GEOLOGIC STRUCTURE.

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WASHINGTON WATCHING

BY HENRY D. RALPH

U. S. Tanker Operations

WASHINGTON.—Continued operation of tankers by the U. S. Maritime Commission is facing serious opposition in the House committee on merchant marine in spite of vigorous assertions from both commission officials and industry spokesmen that this is the only way in which world petroleum needs can be met.

The committee is conducting a general investigation of commission activities under the Ship-Sales Act and is considering legislation to continue the commission's authority to operate vessels of various types under a "general agency agreement" charter program beyond June 30.

Some 230 government-owned surplus tankers are now being operated by the commission under the G.A.A. plan in both domestic and foreign service, and the committee is highly critical of this because the Ship-Sales Act specifically prohibits chartering tankers. Several committee members have expressed the view that oil companies will purchase these tankers if the Government stops this operation.

Factors Deterring Purchase

The commission chairman, Vice Adm. William W. Smith, has told the committee repeatedly that oil companies have bought virtually all the tankers they need for their permanent business, that the Navy has prevented sale of more surplus tankers to foreign governments, that the G.A.A. plan costs oil companies more than to move oil in their own ships and is more profitable to the Government than laying the ships up for sale, and that the current tanker demand is abnormal and will subside as soon as foreign petroleum facilities are rebuilt and foreign tankers now under construction are completed. The committee has been told that oil companies will not purchase many more tankers because their anticipated future business does not warrant it, because these vessels are becoming obsolete and the companies have plans for constructing more efficient tankers when the need arises, and because they do not want their entire fleet to be of the same vintage and wear out at the same time.

In spite of these protestations, the committee appears disinclined to approve an extension of the authority to operate tankers under the G.A.A. system or to amend the law to permit "bareboat" or outright charter of tankers to oil companies. This position may be altered before the hearings conclude, as oil company officials are now scheduled to testify.

The position of the entire tanker industry was presented to the committee late last week by Almon E. Roth, president of the National Federation of American Shipping, who insisted that the demand for the use of surplus tankers is only temporary.

Secondary-Recovery Forum

THE Secondary-Recovery Forum being held in Washington this week under the auspices of the Oil and Gas Division may adopt some sort of procedure for return engagements every year or so.

With OGD facing early death for lack of appropriations, there was a feeling that some sort of arrangement should be made to schedule further round-table discussions on secondary-recovery problems in the future. This week's meeting was something of an experiment, and no formal agenda was prepared and no technical papers were scheduled.

The hope was that by getting all interested persons to talk over their progress and problems it might be possible to work out a method for coordinating their activities in the future by eliminating overlapping and filling in gaps not now covered. It was planned to ask all participants to tell who is doing what and how, and thus give all a general picture as to the progress being made in better methods of recovering crude from older fields. Discussions were expected to cover a survey of current accomplishments, an estimate of potentialities and areas of greatest promise for additional work, division of research activities as between private operators and state and federal agencies, and legal problems arising out of various state laws.

Missing Documents

THE mystery of the missing papers in the Saudi Arabian oil negotiations is still more intriguing to the Senate investigating committee than the facts about the Navy's present contract to purchase oil from the Arabian-American Oil Co.

The committee wants to know why the White House and Navy Department files don't contain all the documents that explain why the Government turned down a 1941 offer to sell oil at a low price if the Government would make a loan or advance payments to King Ibn Saud. This offer was made through James A. Moffett, who recently told the committee that it would have been much more advantageous to the Government than the present sales contract which, he says, gives the company unreasonably high profits.

For several hours last week the committee interrogated executors of the late President Roosevelt's estate and custodians of the Hyde Park library in an attempt to get a look at the files. All they got was a promise that the custodians would search for anything pertaining to oil, Moffett, or Saudi Arabia; an indication that the files do contain several documents bearing on the subject; and assurance that anything found will be sent to President Truman for possible transmittal to the committee.

Most revealing disclosure was that the Roosevelt papers are incomplete, badly jumbled, and difficult to classify. In many cases President Roosevelt scribbled a memo on an original letter and sent it to some official without keeping a copy; frequently neither original nor copies can be found though there are other letters referring to correspondence now missing. All government departments were requested to return all original documents to the Roosevelt library, but the files are still far from complete. The custodians indicated that this confused condition, rather than a deliberate attempt to destroy the evidence in the Arabian oil matter, is the explanation for the committee's quandry.

Thus the custodians have not been able to find the original letter Moffett sent the President, nor any copy of it except one which the State Department came up with, but they have located various entries in the files indicating that there was considerable correspondence between the White House and the Navy and State Departments on the subject.

Meanwhile company officials, who doubtless could explain the history of the entire negotiations, have not been called by the committee and probably will not be asked to testify until the committee has finished combing the government archives.

Aviation-Gasoline Tax

A SPECIAL federal tax on aviation gasoline of 1½ cents per gallon is actively under consideration by the Civil Aeronautics Board and the Civil Aeronautics Authority as a means of helping to finance the Government's

extensive system of civil airways, air fields, and landing aids.

This was revealed during hearings on the Commerce Department appropriation bill when committee members were criticizing these agencies for the heavy cost of the program. They insisted that some way be found to make the aviation industry pay at least a part of the costs, but the government officials were unable to offer many concrete suggestions except the gasoline tax. They estimated that a tax of 1½ cents per gallon would bring in about $5,764,000 during 1948, whereas the airways program costs around $50,000,000 per year.

But CAA and CAB hesitate to recommend this tax until the states definitely agree to stop taxing aviation gasoline as they tax motor fuel. They suggested that Congress authorize a conference of state officials to obtain an agreement that the states withdraw from this field of taxation and approve of a federal aviation-gasoline tax to be applied to the airways program.

Curtailed Statistical Work

REDUCED appropriations for statistical work by the Bureau of Mines may result in adoption of one of the recommendations of the statistical advisory committee of the National Petroleum Council, but will retard its recommendation that all government statistics be improved and issued more promptly.

The committee recommended that the Bureau of Mines drop its weekly report on crude-oil stocks and that this be issued by the American Petroleum Institute. The chief reason for this is that other A.P.I. figures are issued on a weekly basis, while Bureau statistics are largely monthly.

On the other hand, the committee asked that various government agencies make some additional surveys to fill in gaps in data now available to the petroleum industry, and it also recommended that the Government revise some of its statistical series and issue all of them more promptly after the close of the period covered. Since not only the Bureau of Mines but most other federal agencies are suffering from a reduction in appropriations, the chances are that all of them will complain that they can't do a better job unless they get more funds.

All government statistics, particularly those of the Bureau of Mines, should be issued more promptly, the committee said, and recommended that the OGD review the causes of delay and attempt to arrange for prompt reporting. Simplification and improvement of reports of government and other agencies should be done with the assistance of committees already in existence, and these committees should review any new reports contemplated by government agencies, the committee said.

Other recommendations were that the Bureau of Mines make periodic surveys of available and unavailable crude-oil and major product inventories; that the Department of Commerce make an annual survey of the ultimate use of lubricating oils; that refinery statistics on gas oil and distillate fuel oil be broken down into heating oils, diesel fuels, and gas oils; that condensates be segregated from figures on crude and natural gasoline and that such reports show separately the current production of other products of natural gas such as propane, butane, isobutane, isopentane, pentane, and blends; that the Bureau of Labor Statistics review and improve its indexes on petroleum prices, wages, and hours; that import and export statistics be improved both as to content and timing; and that the Oil and Gas Division prepare an index of current sources of oil and gas statistics.

Statistics needed primarily by the military for security purposes in addition to those generally available should be gathered directly by the Army or Navy in cooperation with a special industry committee appointed for the purpose, it was concluded.

Compact Renewal

THE Interstate Oil Compact must be renewed before the end of the current session of Congress, but there is nothing the federal Government can do about it until the compact states make a request.

The compact was last renewed in September 1943 for a 4-year period, so its validity ends this fall. Renewal is expected to be a formality, since the White House and executive departments favor its continuance. Procedure is for the signatory states to request a renewal and transmit it to the State Department, which is the repository of such "treaties" among states. It will then go to the White House for submission to Congress which, under the Constitution, must approve of all formal agreements involving cooperative action of two or more state governments.

New Antitrust Tack

THE antitrust work of the Department of Justice fared rather well at the hands of the House appropriations committee, and this activity will continue at about the same level as at present.

However, its emphasis is being shifted, and Atty. Gen. Tom Clark told the committee that the antitrust division will spend most of its time on big cases which set precedents and less time going after "small fry." The biggest problem today, he said, is the growing concentration of economic power in the hands of big corporations and groups of companies which dominate entire industries, and he intends to break up some of these by divorcement proceedings and to prevent others by actions to stop contemplated mergers of corporations.

"We want to be practical about it," he told the committee. "We do not want to go around and try to control the economy of the country with consent decrees, or by injunctions, or by clouting people over the head with indictments. But we want to try to stop these concentrations.

"A few years ago we had an all-out program, on all fronts. We tried to file as many cases as we could. Most of them ended up in consent decrees or pleas of what we call nolle contendere, and fines. In my opinion the nolle contendere pleas and the fines are purely a license to carry on an illegal business under the antitrust laws. I do not think we have accomplished much with those. On the consent decrees, changing conditions of business, the necessities that business have to face every day, the fact that problems tomorrow are not what they are today in business means that consent decrees become stale pretty quickly and do not have much effect. I think what we must do is to prevent any further concentrations."

Factors Controlling Fuel Performance Outlined

BARTLESVILLE, Okla.—Features of engine design, properties of engine fuel, and the conditions under which an engine operates form three major factors in the control of engine-fuel performance, Wheeler G. Lovell, assistant head of the fuel department, General Motors Research Laboratories, indicated before the Mid-Continent Section of the Society of Automotive Engineers May 8.

Outlining the dependence of engine-fuel performance on conditions of operation, the speaker showed how comparative antiknock quality may be changed widely by differences in operating conditions. Using two sets of test conditions, one set comparing closely to the research method, the other approximating the A.S.T.M. motor method, Lovell illustrated how two test fuels rated comparatively under one set of conditions may show a reversal of antiknock quality when tested under the other set of conditions.

The problem of secondary standard reference fuels has been a serious one, he said, due to the fact that, while secondary fuels may agree with primary reference standards under one set of conditions they may introduce an error and new variables under other test conditions.

H. H. Glen, left, Emsco Derrick & Equipment Co., Los Angeles, outgoing president of the Petroleum Equipment Suppliers Association, is shown talking to Ardon B. Judd, Republic Supply Co., Houston, new president, center, and A. W. McKinney, National Supply Co., Toledo, vice president

Judd Named President Of Equipment Suppliers

ARDON B. JUDD, Republic Supply Co., Houston, was named president and A. W. McKinney, National Supply Co., Toledo, vice president of the Petroleum Equipment Suppliers Association at the annual meeting of the group in San Francisco.

About 130 oil-equipment manufacturers and supply company officials attended the 4-day event. Arrangements for the meeting were made by Pacific Coast members of the association. Next meeting will be held in Colorado Springs.

Directors elected at the meeting were:

Eastern Division

George H. Alten, Alten's Foundry & Machine Works, Lancaster, Ohio; Karl Elliott, Acme Fishing Tool Co.; Parkersburg, W. Va.; Dave Fox, Branchland Pipe & Supply Co., Huntington, W. Va.; Jene Harper, Franklin Supply Co., Chicago; Mason Jones, S. M. Jones Co., Toledo; A. S. Knowles, Parkersburg Rig & Reel Co., Parkersburg, W. Va.; Donald W. Mackie, Bradford Supply Co., Bradford, Pa.; Fred F. Murray, Oil Well Supply Co., Dallas; A. W. McKinney, National Supply Co., Toledo; Fred J. Spang, Spang & Co., Butler, Pa.; and H. Bernard Wehrle, McJunkin Supply Co., Charleston, W. Va.

Mid-Continent Division

W. M. Bovaird, Bovaird Supply Co., Tulsa; H. B. Gutelius, United Supply & Manufacturing Co., Tulsa; W. H. Larkin, Larkin Packer Co., St. Louis; Earl Miller, American Iron & Machine Works, Oklahoma City; S. P. Wallace, Maloney-Crawford Tank & Manufacturing Co., Tulsa; George Hayes, Hinderliter Tool Co., Tulsa; Joe Eustice, W. C. Norris, Manufacturer, Tulsa; Walter O'Bannon, Walter O'Bannon Co., Tulsa; J. L. Shakeley, Jones & Laughlin Supply Co., Tulsa; Guy Tompson, Bethlehem Supply Co., Tulsa; Jay P. Walker, National Tank Co., Tulsa; and Carl White, Jr., Franks Manufacturing Co., Tulsa.

Southwestern Division

Lip Norvell, Norvell-Wilder Supply Co., Beaumont, Tex.; Allen Guiberson, Guiberson Corp., Dallas; Rex G. Hamaker, Reed Roller Bit Co., Houston; Frank Hereford, Murray-Brooks Hardware, Lake Charles, La.; Ardon B. Judd, Republic Supply Co., Houston; E. L. Lorehn, Cameron Iron Works, Houston; K. W. Davis, Mid-Continent Supply Co., Dallas; Fred Mayer, Continental Supply Co., Dallas; Ralph Neuhaus, Hughes Tool Co., Houston; George O'Leary, Houston Oil Field Material Co., Houston; Walter B. Sharp, Mission Manufacturing Co., Houston; and Wallace Wilson, Wilson Supply Co., Houston.

Pacific Division

. J C. Axelson, Axelson Manufacturing Co., Los Angeles; Markley C. Brown, Hillman-Kelley, Inc., Los Angeles; J. A. Crawford, Youngstown Steel, Los Angeles; E. S. Dulin, Byron Jackson Co., Los Angeles; R. S. Durkee, Lane-Wells Co., Los Angeles; D. S. Faulkner, National Supply Co. of California, Los Angeles; H. H. Glen, Emsco Derrick & Equipment Co., Los Angeles; H. E. Howard, Howard Supply Co., Los Angeles; Warner Parker, Oil Well Supply Co., Los Angeles; John J. Pike, Republic Supply Co. of California, Los Angeles; Wendell Jones, Bethlehem Supply Co. of California, Los Angeles; and Ted Sutter, Baker Oil Tools, Inc., Los Angeles.

Montana Association Asks Funds for U. S. G. S. Office

Restoration of funds eliminated by the House appropriations committee which affect work of the Great Falls, Mont., office of the U. S. Geological Survey was urged in a resolution passed at the recent annual meeting of the Montana Oil and Gas Producers Association in Shelby, Mont.

At the meeting, it was pointed out that if the federal geologists did no more than prevent the drilling of three dry holes a year in Montana, the $32,000 annual outlay for the Great Falls office would be justified. Other resolutions passed at the meeting asked that federal lands acquired during the war and not now needed be restored to private ownership and that the Natural Gas Act be amended to curtail powers of the Federal Power Commission. Mose Wagner was named president of the association.

Gas-Measurement Course Attracts Wide Interest

NORMAN, Okla.—According to registration records, the 3-day Gas-Measurement Short Course at the University of Oklahoma is receiving more attention from representatives of the natural-gas industry than ever heretofore.

Held annually except in 1933 and 1943, the course has been in existence since 1924. Attendance May 6-8 this year was made up of individuals in industry from all sections of the country. The course, open to anyone interested in the subjects of gas measurement and regulation, is scheduled for April 13-15 in 1948.

The 3 days of the course were divided into nine class periods. Subjects ranged from the fundamentals of gas measurement and regulation to operation, maintenance, and accounting.

Committee chairmen for the 1948 short course are: E. C. McAninch, district manager, Oklahoma Natural Gas Co., Ardmore, Okla., general chairman; T. S. Whitis, Amarillo Oil Co., Amarillo, Tex., exhibits; C. E. Terrell, Southern Natural Gas Co., Birmingham, Ala., program; J. L. Griffin, Northern Natural Gas Co., Omaha, practical methods; and Ben F. Worley, United Gas Corp., Houston, publications. The executive committee headed by W. H. Carson, dean of engineering, the University of Oklahoma, is unchanged for 1948.

D. A. Hulcy, president, Lone Star Gas Co., Dallas, principal speaker at the short course

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(Signed) E. J. Gray, Pumper,
Kilgore, Texas

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PERSONALS

Eardley Named Chief Petroleum Engineer

W. A. EARDLEY has been appointed chief petroleum engineer in the producing department of the Standard Oil Co. of California, it was announced last week.

He succeeds E. G. Gaylord, who recently was elected a vice president and director of the California Research Corp., a Standard of California subsidiary.

Eardley, a graduate of Stanford University, joined Standard of California in 1926 and has served as petroleum engineer in southern California and the company's home office in San Francisco. In 1943 he was named supervising petroleum engineer in San Francisco and held that position at the time of his recent appointment.

James C. Crayhon, in charge of press relations for Standard Oil Co. (N. J. visited Humble Oil & Refining Co., Houston, and Carter Oil Co., Tulsa, last week. He was engaged in newspaper and Associated Press work for a period of 20 years before joining Standard's public-relations organization.

W. Harold Rea, executive assistant to the president, has been elected to the board of directors of Canadian Oil Companies, Ltd. Other recent changes include: **R. T. Eyre,** formerly operations manager, who has been elected vice president in charge of operations; **R. C. West,** formerly general sales manager, elected vice president in charge of sales; **Douglas Robinson,** appointed secretary of the company while retaining his present position of solicitor; and **H. F. Hoecker,** named manager of the newly created real-estate department.

Dr. Paul H. Carnell has resigned his position in the research department of Phillips Petroleum Co., Bartlesville, Okla., to join Leonard Refineries, Inc., Alma, Mich., in charge of research and development.

David B. Harris, treasurer, and **J. A. Neath,** director, early this week were elected vice presidents of Humble Oil & Refining Co. Neath was a vice president of Humble Pipe Line Co. before becoming a director of Humble Oil & Refining Co. Harris will continue as treasurer.

William H. Strickler, superintendent of land and exploration for Sohio Petroleum Co. in Michigan, has been promoted to manager of all Sohio's production activities in the state. **J. E. Buckley,** assistant superintendent of operations, has been appointed superintendent, succeeding **C. C. Irby,** who recently was transferred to Kansas.

Andre Berquint, chief engineer of Societe Cherifienne des Petroles, and the following engineers from the same company are now in the United States studying drilling problems in Texas and Oklahoma: **Emile Dutrieux, Roger Gouteyron, Marc Poncet,** and **Jean-Baptiste Wirth.** Other Societe Cherifienne personnel also here studying drilling problems are: **Justin Laguillonie, Jean Navarro, Rene Locquier,** and **Robert Bozon.**

P. C. Musgrove, who resigned recently as superintendent of operations in Kansas for Sohio Petroleum Co., has organized Musgrove Petroleum Co. in Wichita, Kans.

Dr. Robert K. Dix has been named coordinator of a new training program for technical employes in the Louisiana Division of Standard Oil Co. of New Jersey. He has been in the chemical technical-service department.

Donald M. Taylor has joined the Tennessee Gas & Transmission Co.'s engineering department and will be stationed at the compressor plant at Natchitoches, La. Taylor, a mechanical engineer, was formerly with E. B. Badger Co., Boston, in refinery construction work and is a veteran of 2½ years in the Navy. After his discharge and before going with Tennessee Gas, he was a partner in an engineering firm in Baton Rouge.

Harold A. Collins, engineer in the West Coast production department of Shell Oil Co., Inc., at Mid Station, has been transferred to Kettleman Station. Other production department changes include: **Arthur H. Davis,** junior engineer, from Bakersfield to Sacramento; **Olva H. Niemela,** from junior engineer to junior mechanical engineer at Ventura; and **Dale F. Walker,** from temporary small plant engineer to permanent small plant engineer in the coastal division.

E. J. Barth, petroleum technologist, will leave the United States May 19 for Sweden, where he will be associated with A. Johnson & Co. Oil Refineries as petrochemical and re-

Robert G. Dunlop, new president of Sun Oil Co., compares notes with J. N. Pew, Jr., chairman of the board; George M. Closs, Toledo refinery manager; and J. Howard Pew, former president, before the four took the platform at the third annual rally of more than 1,000 employes of the Toledo refinery. It was Dunlop's first appearance before an employe group since becoming president

PERSONALS

fining specialist dealing with new petroleum processes and products.

J. R. Ellis, associated with Great Lakes Pipe Line Co. since 1934, has been named manager of the products pipe-line division of Sunray Oil Corp., Tulsa. Ellis, who started with Great Lakes as a gang laborer, was named district engineer in 1946 and built several pipe lines, including the line from Kansas City to Omaha.

Jack Lander will succeed **P. R. Smith** as chief scout for Pure Oil Co. upon Smith's retirement May 15 after 27 years of service. Lander has been with Pure since 1936.

Don Sloan, former senior clerk in the engineering department of Panhandle Eastern Pipe Line Co., has been transferred to the transmission-compressor department in the company's Kansas City, Mo., office as assistant engineer in charge of budgets, materials, and special problems.

Joseph T. Cashman, Shell Oil Co., Inc., has been appointed administrative assistant to **D. B. Hodges,** New York, vice president, transportation and supplies. Cashman formerly was an attorney in the company's legal department.

R. Clare Coffin, geophysical coordinator of Stanolind Oil & Gas Co., was elected president of the Tulsa Geophysical Society at the group's first annual meeting. Other officers are **Dr. A. B. Bryan,** chief geophysicist for Carter Oil Co., first vice president; **H. M. Thralls,** chief geophysicist, Seismograph Service Corp., second vice president; and **Francis F. Campbell,** geophysical supervisor for Amerada Petroleum Corp., secretary-treasurer.

Allen Cameron, methods engineer in the Point Breeze refinery of Atlantic Refining Co., has been promoted to plant standardization engineer. Other Atlantic promotions and transfers include: **Walter J. Lufkin,** from time study engineer to methods engineer, Point Breeze; **Thomas A. Nupp,** from plant-standardization engineer to shop-mechanic industrial engineer; **Kenneth L. Dominy,** from production engineer at Great Bend, Kans., to drilling engineer, Dallas; and **Richard Gordon Dulaney,** from assistant reservoir engineer to administrative assistant, Dallas.

E. J. Schiffer, veteran of 32 years' service in the traffic department of Gulf Oil Corp., has been appointed general traffic manager for Gulf filling a vacancy left by the recent death of J. C. Beck. Schiffer will continue to make his headquarters in Pittsburgh.

James Worsdall, formerly with the Shell group in Trinidad and Mexico, has opened an office as consulting engineer and contractor in Maracaibo, Venezuela.

Cecil C. Johnson, formerly with Public Service Co. of Colorado, Denver, has joined Tennessee Gas & Transmission Co. as budget director in Houston.

James L. Kincaid has joined Pure Oil Co., Southwest division, as gas-measurement engineer in Van field, Texas. He formerly was oil and gas engineer for Texas Electric Service Co., Fort Worth, and is a graduate petroleum engineer from the University of Oklahoma.

M. R. H. Cogan, Shell Chemical Corp. engineer, has been promoted to chief engineer at Houston. Other promotions and transfers of the company include: **J. G. Dickerson,** technologist, from Los Angeles to San Francisco; **L. F. Gaines,** engineer, from Shell Point to Houston; **A. J. Garon,** technologist, from San Francisco to North Carolina; **N. L. Gianakos,** from chemist to senior chemist, Houston; **W. J. Howell,** junior technologist, from San Francisco to Los Angeles; **Carl MacHenry,** from department manager, Houston, to senior technologist, San Francisco; **A. L. Navarro,** from junior technologist, Torrance, to technologist, San Francisco; and **F. G. Watson,** from assistant department manager to department manager, Houston.

Lt. Col. Victor Moore will soon take over duties as the Army's petroleum officer in Frankfurt, Germany. Moore has been attached to the Army - Navy Petroleum Board in Washington.

Harris Allen, Phillips Petroleum Co., has been transferred from Bartlesville, Okla., to Houston as division geologist. **F. J. Latinis,** Houston, division land man for Phillips, has been transferred to Wichita as Kansas division land man, exchanging positions with **Robert Rood.**

Gaynor H. Langsdorf has been elected a vice president and director of Oronite Chemical Co., in charge of products and processes. Langsdorf has been manager of technical services in the manufacturing department of Standard Oil Co. of California, Oronite's parent company. In another change, **Norman N. Gay,** previously manager of Oronite's product-development division, has been transferred to California Standard's special-products division.

E. C. Overbeck has been elected a vice president of Ohio Fuel Gas Co. at Columbus, Ohio, and placed in charge of plant operations, including production, transmission, and engineering. Overbeck started in the gas business as a well tender for Ohio Fuel Supply Co. in Northern field 34 years ago and was successively foreman, superintendent, assistant manager of production, and manager.

M. L. Clayton has been promoted from drilling foreman to senior drilling foreman for Shell Oil Co., Inc., in the Houma, La., district. Recent transfers in the Shell organization include: **Frank Perkins, Jr.,** junior exploitation engineer from Black Bayou to Houma, La.; **J. B. Jones,** chief clerk, from Jackson, Miss., to Houston; and **G. T. Roberts,** senior exploitation engineer, from Tulsa to the regional staff in Houston.

New officers of the Ark-La-Tex chapter of the Division of Production of the American Petroleum Institute are: R. A. Seale, Globe Supply Co., and D. W. Akins, Jr., Ohio Oil Co., advisory committee members; J. T. Reynolds, Sohio Petroleum Co., first vice chairman; H. L. Kirkpatrick, Arkansas Fuel Oil Co., chairman; John Cooke, Carter Oil Co., second vice chairman; B. F. Carter, Union Producing Co., secretary-treasurer; and B. J. Dowd, Union Producing Co., advisory committee member. Not in the picture are O. W. Lyons, program chairman, and V. J. Martzell, advisory committee member

PERSONALS

Leo L. Baker has resigned from Core Laboratories, Inc., to join DeGolyer & MacNaughton, Dallas, as petroleum engineer.

A. Blanchard, president of Societe Nationale des Petroles d'Aquitaine and Groupement d'Achat des Carburants, has just left the United States for Paris after a short business trip here.

Karl A. Mygdal, district geologist for Pure Oil Co., Midland, Tex., has been transferred to the company's Fort Worth office, where he will set up and supervise a new geological engineering department. **M. D. Mauck,** of the geological department at Midland, succeeds Mygdal as district geologist.

Clyde Simpson, formerly assistant to the general manager of Loffland Brothers, drilling contractors, has been elected a vice president of Thomas P. Pike Drilling Co., Los Angeles.

B. C. Deardorf is president of the newly organized Deardorf Oil Corp. Other officers of the company, which has its headquarters in Oklahoma City, include **James V. Harbison,** secretary-treasurer; **E. G. Dahlgren,** assistant secretary and director; and **W. G. Post,** formerly with Sinclair Refining Co. and later with Sinclair Navigation Co., director.

W. S. S. Rodgers, chairman of the board, and **J. V. Doll,** manager, national sales division, The Texas Co., conferred with Fort Worth division officials last week before continuing to the West Coast on their transcontinental inspection tour of Texaco facilities.

Raymond E. Paul, graduate engineer from the University of Wisconsin, is the first in the anticipated group of junior engineers to be employed by Arkansas Natural Gas Corp. and associated companies, in its postwar program of development. Paul has been temporarily assigned to the land and geological department at Shreveport.

H. F. Schwede, research engineer, Schlumberger Well Surveying Corp., Houston, addressed the monthly meeting of the East Texas Section, American Institute of Mining and Metallurgical Engineers, this week in Shreveport, on radio-active markers in well completions.

O. D. Story, Houston, past president of the Houston Purchasing Agents Association, has been placed in charge of all purchasing stores for exploration and production activities for Shell Oil Co., Inc., east of the Rockies. Story has been with Shell 25 years.

E. E. Dattner has been elected president of the Old Timers club of The Texas Co., succeeding R. B. McLaughlin, president, Texas Pipe Line Co.

R. E. Hart, Cities Service Oil Co., has been elected president of the Mississippi Landmen's Association. **W. R. Beam,** Carter Oil Co., was named vice president, and **Ben F. Witt,** Amerada Petroleum Corp., secretary-treasurer. Elected to the executive committee were **M. McKay,** Magnolia Petroleum Co.; **P. V. Hitt,** Shell Oil Co.; **B. E. Gamble,** Lion Oil Co.; **A. J. Viets,** Sun Oil Co.; and **C. H. Fidler,** Tide Water Oil Co.

SHIFTS—

John S. Russell, engineer, Magnolia Petroleum Co., Edna to Vanderbilt, Tex.; **O. V. Drake,** engineer, Gulf Refining Co., Greenville to Ranger, Tex.; **R. M. Wemple,** engineer, Pan American Production Co., Lyford to Harlingen, Tex.; **Clifford H. Overly,** engineer, Stanolind Oil & Gas Co., Bay City to Conroe, Tex.; **G. F. Robie,** engineer, Phillips Petroleum Co., Borger to Phillips, Tex.

Darrell Smith, engineer, The Texas Co., Conroe to Freer, Tex.; **A. H. Garrison,** superintendent, Shell Oil Co., Houston, to Wood River, Ill.; **R. H. Alagood,** geologist, Sunray Oil Corp., San Antonio to Jackson, Miss.; **O. E. Van Meter, Jr.,** engineer, Magnolia Petroleum Co., Wichita Falls to Kermit, Tex.; **Earl Reeves,** foreman, Union Sulphur Co., Inc., Grosse Tete to Church Pt., La.

Albert H. Melshermer, geologist, Union Sulphur Co., Inc., Sulphur, La., to San Antonio; **Paul B. Fahle,** geologist, Plymouth Oil Co., El Dorado, Ark., to Shreveport; **E. V. Foister,** foreman, Phillips Petroleum Co., Carmi to Flora, Ill.; **John R. Burns,** foreman, Ashland Oil & Refining Co., McLeansboro, Ill., to Henderson, Ky.; **Henry H. Branham,** superintendent, Oklahoma Engineering Co., Laurel, Md., to New Haven, Conn.

Carl M. Landry, engineer, California Co., Rangeley, to Hamilton, Colo.; **Alfred Yocum,** foreman, Columbian Fuel Corp., Ulysses, Kans., to Optima, Okla.; **B. C. Dunn,** geologist, Ohio Oil Co., Wichita, Kans., to Dwiango, Colo.; **J. O. Laws,** foreman, Amerada Petroleum Corp., Guthrie, Okla., to Lamar, Colo.

DEATHS

William H. Pomeroy, 67, independent operator and partner in the firm of Pouder-Pomeroy with offices in Tulsa, Houston, and Midland, Tex., died May 10 in Midland.

Chal N. Daniel, 59, Vivian, La., oil operator, died May 6 in an automobile accident at Andalusia, La.

Samuel A. McKechnie, 68, prominent as a drilling contractor and gas operator in Ontario fields for 40 years, died recently in Dunnville, Ont.

John E. Bahan, 62, district manager for United Gas Pipe Line Co., died May 4 in a Dallas hospital. He had been manager in Dallas since 1943.

Edward Neal Gillespie, 78, one-time partner in Guffey-Gillespie Oil Co., which operated in Texas and Oklahoma, died May 5 at his home in Freeport, Pa.

J. R. Battenfield, 59, president of Battenfield Grease & Oil Corp., died May 7 in a Kansas City hospital.

Frank L. Blackburn, 68, director, vice president, and secretary of Gas Advisers, Inc., New York, died recently at his home in Westfield, N. J. He joined Gas Advisers in 1938. Previously he had headed the statistical department of Cities Service Co.

Lawrence Lowell McDermott, 52, pioneer operator in Bradford field, died May 3 at his home in Gifford, Pa.

Fred L. Beckwith, independent producer, died May 5 at his home in Portville, N. Y.

Hugh McPherson, 79, Canadian driller in foreign fields, died at Petrolia, Ont., recently. He had drilled in Borneo, Java and Iran, and helped protect the Iranian oil wells and pipe lines in World War I.

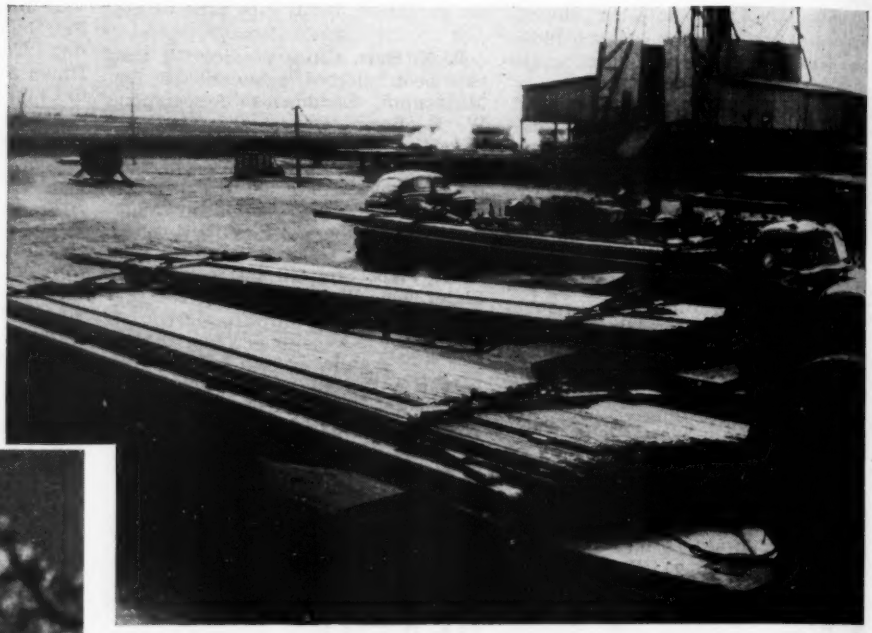
James E. Koeberle, 81, geologist who supervised oil developments in the Rancho La Brea when the first well was brought in 40 years ago and who also participated in oil activities at Signal Hill, died May 8 at his home in Los Angeles.

Frank Albert, 73, pioneer Oklahoma driller and later drilling and production superintendent at Drumright for Sinclair Oil Corp., died May 10 at his home in Tulsa.

Fishing and Cutting

Superior Oil Co. 51-11 Weller wildcat (below). At time photograph was taken, the first inside cut had recovered 16,410 ft. of drill pipe which is shown standing in the derrick. A branch of Oklahoma's famous redbud is seen in foreground

Some of the joints of small pipe used in making the inside cut are seen in the view at right. It took five trucks to transport the 17,000 ft. of this pipe



SUPERIOR OIL CO., after establishing a world's record in carrying its Fort Cobb, Oklahoma, well to a depth of 17,236 ft., has established another record by successfully recovering all drill pipe which recently became stuck at a point 20 ft. off bottom. Later field reports are that the drill collars also have been recovered and that the world's deepest well has resumed "drilling deeper."

When drill pipe sticks in an ordinary well drilling within customary depths, it is often quite an involved procedure to clear the hole, and requires the use of inside and outside cutting tools, washover shoes and casing, and various types of fishing tools. For normal operations, these tools have adequate sections and abilities to function under such conditions. But when a stuck pipe job occurs at the heretofore unpenetrated depth of over 17,000 ft., all the ingenuity, patience, and well technique available are required to remove the fish.

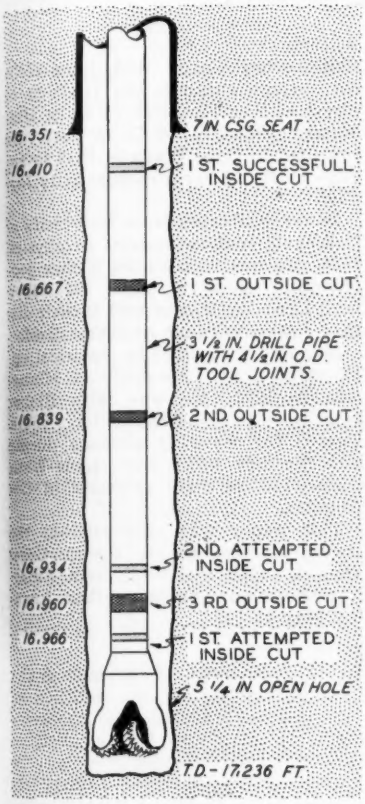
First problem confronting operators was that of determining the best procedure to follow in making the preliminary cut. There were questions as where the most satisfactory depth would be (considering the most ideally suited formation, amount of open hole, etc.) in which to part the drill string. The natural first operation would be the use of the inside cutting tool. The next question was what would be an adequate operating string on which to run this cutting tool. Considerations had to be given to the outside diameter of this string, availability, and the cross-sectional area which ultimately determined its strength. Diameter of the drill pipe in the hole was 3½ in., with 4½ o.d. tool joints. The diameter of the hole is 5¼ in.

Due to the extreme hazard of possibly losing the hole, the cutting and fishing operations on this job were, at the invitation of the operating company, a mutual undertaking of the various service companies in conjunction with Superior's crew and supervision. Tools and personnel of the various service companies were either standing by or actually performing during the various cutting and fishing phases of the job.

The first cut was made by an inside cutter which was run on a string of 1.66 o.d. drill pipe. This is the special drill-pipe size available for use in cutting operations, although it had never been run to make a cut at such depths. This special drill pipe has an inside diameter of 1.086 in. with a cross-sectional area at the root of the pipe thread (which is the

Technique... applied in recovering drill pipe from world's deepest well

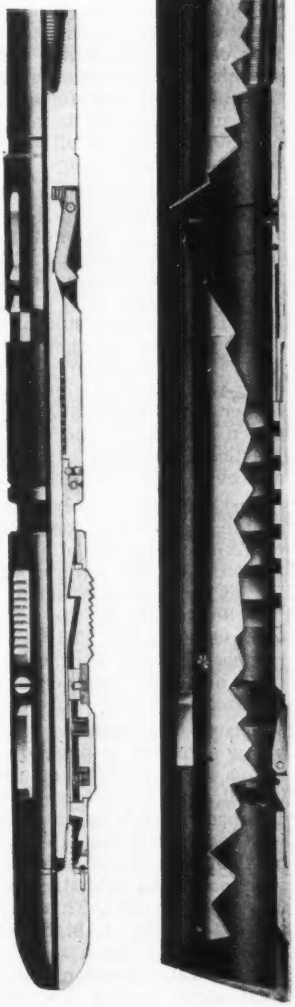
by E. H. Short, Jr.



Above: Diagram showing hole below 7-in. casing and points on the drill where inside and outside cuts were made or attempted

minimum area) of 1.18 sq. in. Considering that the average yield strength for Grade D, the steel from which this pipe was fabricated, is 55,000 psi., a total yield strength of approximately 65,000 lb. is provided at the weakest area. The cutting operation places only the forces of torque upon the operating string, since no upward pull is required by the cutting tool. However, the dead weight of 17,000 ft. of this small pipe approximates 68,000 lb., which is 3,000 lb. in excess of the yield strength. As this was the only means of transmitting rotation to the cutting tool, it was decided to take a

(Continued on page 109)



The first of the two figures at the right shows the various mechanisms of one of the types of inside cutters used. After spotting the tool inside the fish at the desired depth, rotation releases the slip sleeve and permits the slips to anchor the tool to the inside of the fish. The application of weight from above forces the wedge arms under the knives, causing them to expand and contract with the walls of the pipe. Rotation then severs the pipe

Cutting and removing of the segments of drill pipe remaining after the first inside cut was made with a tool similar to that shown at extreme right. Due to the close tolerances on the inside and outside diameters, the outside cutting tool was special, having a body thickness of only ½ in. One of the special tools had a spring and overshot arrangement similar to the one shown here, while the other tool had no spring and used slips instead of dogs in the overshot. Both tools successfully made cuts on each run

Below: Between the second attempt and the first successful inside cut, the drill pipe was perforated at the depth in which the cut was made. These bullet holes permitted circulation and conditioning of the mud between the inside and outside of the stuck drill pipe

New Electrical Logging Techniques

In California

by J. C. Stick, Jr., J. S. Baker, and R. G. Norelius

THE electrical log is recognized to contain valuable information as a quantitative as well as a qualitative tool. A large percentage of the recent work by a number of men in the petroleum field has been aimed at methods of utilizing logs for making reasonably accurate determinations of the characteristics of various types of productive-sand formations. The water-saturation percentage is perhaps the most important of these characteristics since, by using it as a figure of merit, sand quality may be directly and accurately compared among various wells. The means normally used in arriving at water-saturation percentages can be applied only to areas where formation-water resistivities can be determined with a reasonable degree of accuracy and where the purity of the formation water does not cause the true resistivities of water sands and oil sands to present comparable values.

Continental deposits, common to certain California oil fields, can be relied upon in general to present both of these problems. The formation-water resistivities in such areas are all relatively high, with attendant large fluctuations resulting from very slight changes in chemical content. Thus it is common to experience fresh-water sands which show even higher true resistivities than associated oil sands and the normally practiced processes of interpretation and evaluation are of little value.

Past attempts to solve the problem of the fresh-water log have mainly evolved around the alteration of the response of the natural or self-potential curve brought about by varying the salinity of the drilling mud over wide ranges. This method has not been entirely fruitless though results have not been conclusive and the associated cost relatively high.

Recent investigations have yielded a new approach to the convenient solution of the problem of differentiating oil sands from fresh-water sands. The basis of this solution lies in the well-recognized fact that the water permeability of any sand is a direct function of the interstitial-water saturation of the sand.[1] This is to say that a sand having a high interstitial-water content has a higher permeability to water invasion than an equivalent sand having low interstitial-water content. From this it follows directly that a sand containing principally water will have a higher permeability to water invasion than an equivalent sand which is primarily oil saturated. The use of this principle as a means of differentiating oil and water sands, therefore, requires a water-invasion means and a suitable method of detecting or measuring the amount of this invasion.

STICK

BAKER

NORELIUS

Coauthor Stick received his B.S. degree from California Institute of Technology in 1935. He had worked with International Geophysics, Inc., Schlumberger Well Surveying Corp., Technicraft Engineering Corp., and Lane-Wells Co., before entering the Division of Physical War Research at Duke University under N.D.R.C. in 1943. He returned to Lane-Wells in 1946 to engage in electric and radioactivity logging.

Baker graduated from University of California in Los Angeles in physics, 1935. He was with Frank Rieber geophysical laboratory until 1938, then with Lane-Wells, and now is their district superintendent at Bakersfield.

Norelius graduated in electrical engineering from University of Minnesota in 1934. He was with Rieber laboratory in Los Angeles for 3 years. Except for leave of absence during war, he has been with Lane-Wells since 1938, as field engineer in Los Angeles.

This paper was presented at the spring meeting of the Pacific Coast district, Division of Production, American Petroleum Institute, Los Angeles, May 15-16.

Invasion of Mud Filtrate

Fortunately, the normal operations involved in a drilling well provide a suitable source of water invasion in the form of the filtrate from the drilling mud. This drilling-mud filtrate invades permeable formations in an amount and to a depth which appears to bear a definite relation to the water permeability of the formation. This varying depth of invasion of mud filtrate in sands of high and low water saturation is illustrated in Figs. 1A and 4A.

In order to permit the zone of invasion to be differentiated by electrical means it is necessary that the resistivity of the invaded formation be altered to a sufficient degree to be measurable by the electrical log. For the investigation of high-resistivity beds such as fresh-water sands this may be accomplished by lowering the resistivity of the mud at the time of drilling by the addition of salt or other suitable chemical treatment. By this means the electrical resistivity of the invaded zone may be lowered over that of the natural formation by a factor of two or more times.

The actual measurement of the depth of invasion is accomplished by making a series of shallow penetration resistivity curves. This series of curves should start with a measuring depth of penetration of a few inches larger than the bore-hole and increase progressively deeper laterally in small increments until the resistivity measurement passes out of the invaded zone and measures the resistivity of the uncontaminated formation.

The proper interpretation of the series of shallow penetration resistivity curves thus derived requires consideration of certain phenomena common to electrical logs. The resistivity value recorded by an electrical log is influenced by the drilling mud and the formation included within the zone of investigation of the particular curve. As the depth of penetration (lateral investigation) is decreased, the percentage of the total volume investigated which is occupied by drilling mud becomes increasingly larger. Thus, for any giv-

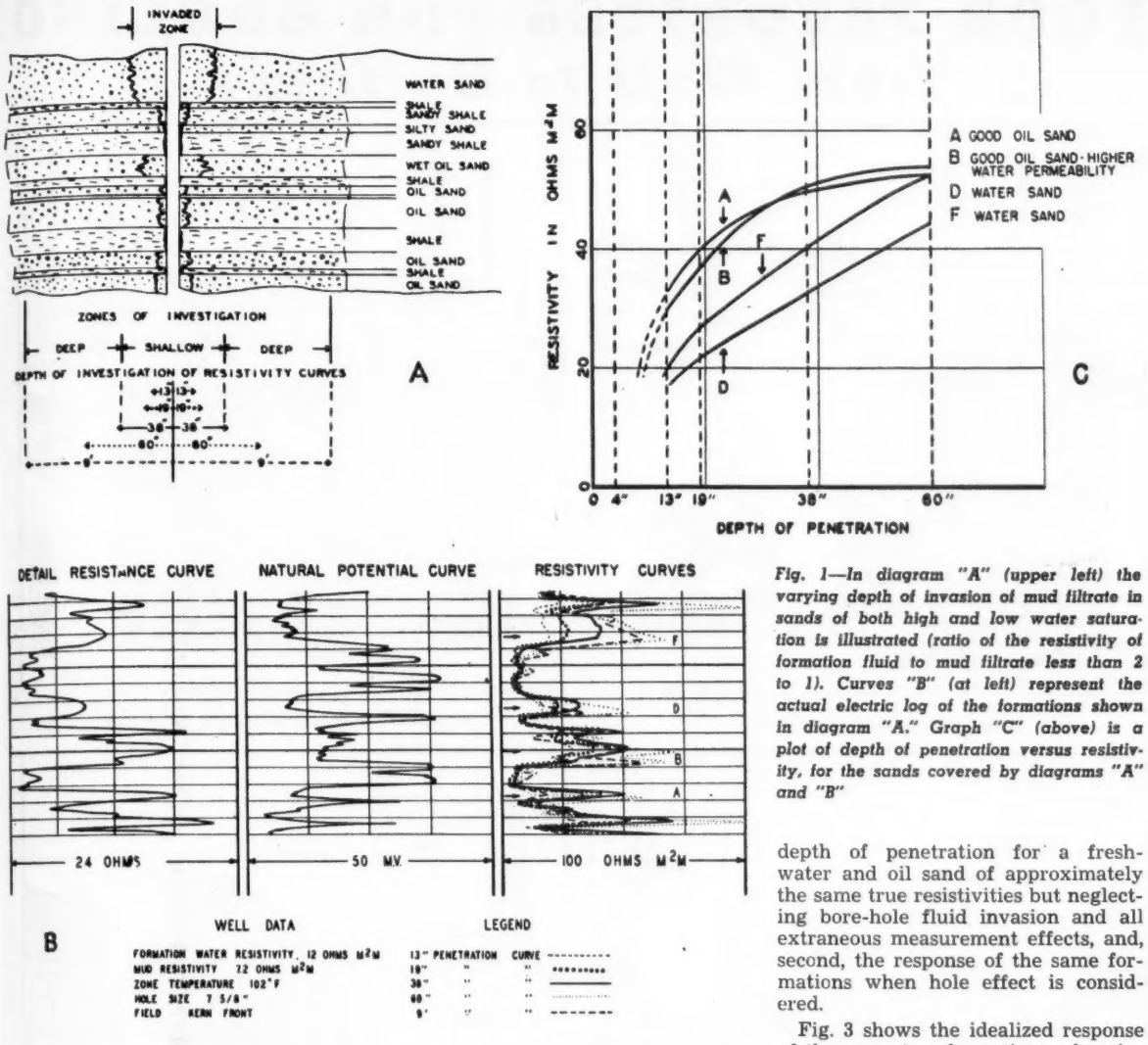


Fig. 1—In diagram "A" (upper left) the varying depth of invasion of mud filtrate in sands of both high and low water saturation is illustrated (ratio of the resistivity of formation fluid to mud filtrate less than 2 to 1). Curves "B" (at left) represent the actual electric log of the formations shown in diagram "A." Graph "C" (above) is a plot of depth of penetration versus resistivity, for the sands covered by diagrams "A" and "B"

en measurement where the mud column is lower in resistivity than the associated formation, the measured resistivity will decrease as the depth of penetration is decreased, even though the true formation resistivity remains the same. This so-called "hole effect" is, therefore, a function of bore-hole size and the ratio of formation and mud resistivities.[2]

It is also true that the resistivity of the formation near the bore hole has a great deal more control in determining the amplitude of the hole effect than that of the more distant formation. Since the mud filtrate lost to the formation from the drilling-mud column alters the resistivity of the formation near the bore hole in proportion to the formation's water permeability it is evident that hole effect is also indirectly a function of water permeability.

It is recognized as possible to correct for this hole effect phenomenon by applying well-known methods of calculation. The use of these formulas, however, normally involves certain assumptions which experience indicates may result in inaccuracies of an order of magnitude approaching that of the sought-after effect. It has, therefore, been found best to analyze the curves graphically, deriving the data directly from measured values on the log and following certain procedures which permit the hole effect to be effectively overcome.

Useful Yard Stick

The most obvious of these procedures is the comparison of sands having approximately the same maximum resistivity as determined from the response on the deep penetration (lateral) resistivity curves. It is further possible to use the response pattern of an impervious formation of the same approximate resistivity as a yard stick, by which the magnitude of the hole effect may be judged and a fair basis for comparing the water permeability of fresh-water and oil sands established.

Fig. 2 is an idealized graph showing, first, a plot of the resistivity vs. depth of penetration for a fresh-water and oil sand of approximately the same true resistivities but neglecting bore-hole fluid invasion and all extraneous measurement effects, and, second, the response of the same formations when hole effect is considered.

Fig. 3 shows the idealized response of the same two formations when invaded by low-resistivity mud filtrate to a depth proportional to their water permeabilities and the appearance of the curves when modified by the hole effect.

It is obvious from this graphical analysis that the loss in low-resistivity mud filtrate to the shallow zone under investigation produces a much smaller reduction in the resistivity of the oil sands than in the water sands and that, for formations of approximately equal true resistivity, this effect can be ascertained by observing the relative steepness of the plotted curves. The practical example shown in Fig. 1C is a plot of the resistivity vs. depth of penetration of the sands A, B, D, and F derived from the actual log shown in Fig. 1B. It will be observed that the curves so derived conform with reasonable closeness to the theoretical curves of Fig. 3 and permit the ready identification of oil and fresh-water sands. In this well the ratio of the resistivities of the formation fluid to the mud filtrate was less than 2 to 1, which is

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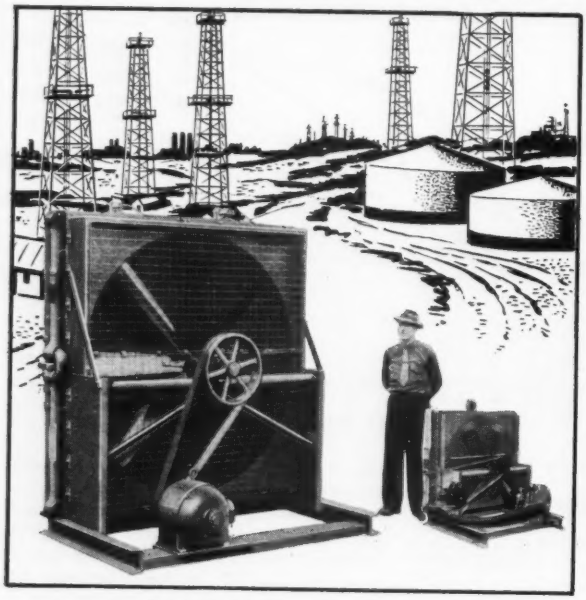

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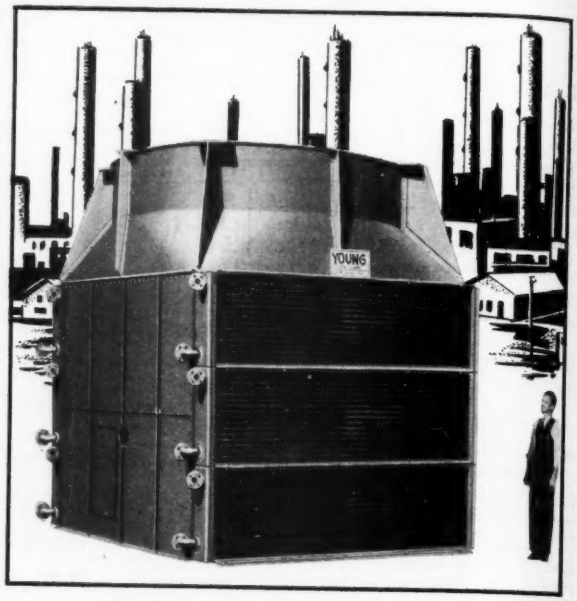

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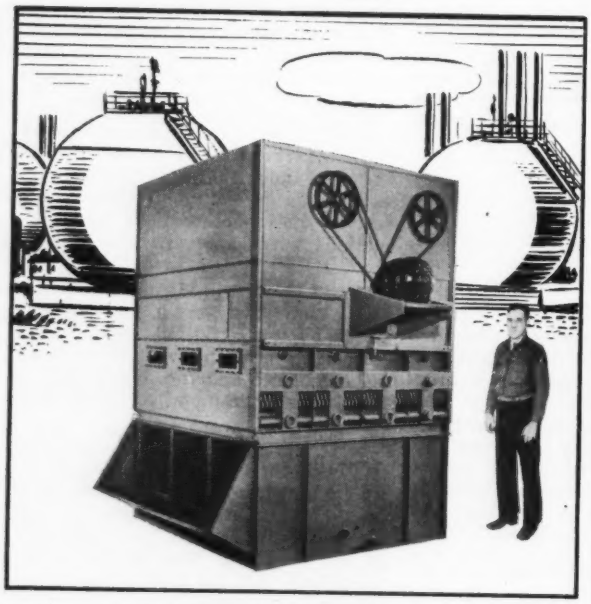

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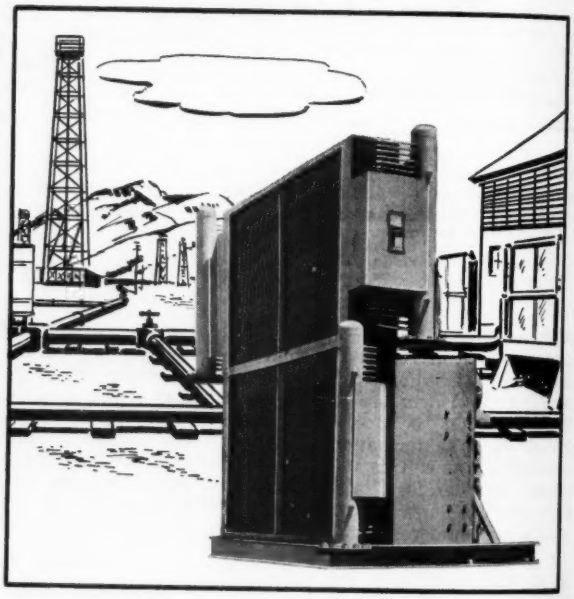

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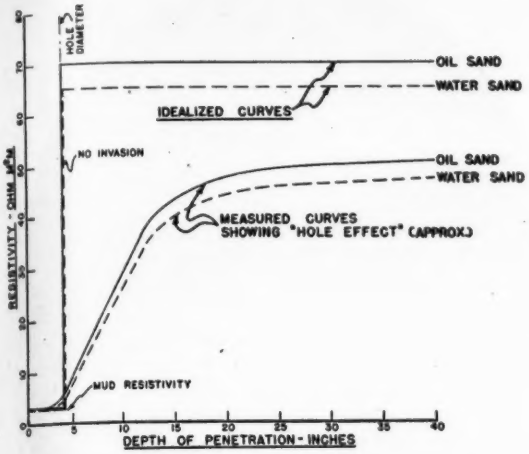

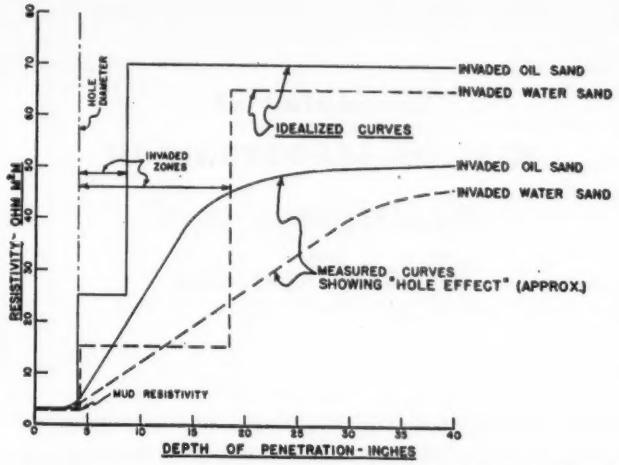

Fig. 2—(Left) Theoretical response of resistivity curves for uninvaded sands. Fig. 3—(Right) Theoretical response of resistivity curves for invaded sands

below the desirable minimum and prohibited more exact interpretation. The response of the detail resistance curve, also included in the figure, is largely determined by the water permeability of the sands and serves to verify these conclusions. Core data from the same well and offset wells substantiated the curve interpretation.

Fig. 4 shows the actual log and plotted curves for another well in the same field which is presented to illustrate a wider scope of interpretation than is possible when the formation fluid-mud filtrate resistivity ratio is of the order of 3 to 1 or higher. The plotted curves of this well show the ability of the method in detecting borderline conditions. If resistivity data from the curves of over 40-in. depth of penetration are used, due consideration of the well-recognized response anomalies should be observed.[2]

It is not always necessary, of course, to plot these curves to make an interpretation. They serve to demonstrate the change in formation resistivity near the side of the bore hole produced by the loss of mud filtrate having different resistivity from the interstitial fluid in the formation and as a convenient means of analyzing the results. The change in resistivity will be proportional to the ability of the formation to take filtrate from the mud column. Thus the problem of differentiating fresh-water sands and oil sands is reduced to one of selecting which of the low water permeable sands are productive oil sands. An examination of the unaltered formation resistivity of sands in question will usually accomplish this, since in the areas concerned, silty sands have inherently lower resistivity and, accordingly, lower response on all resistivity curves.

In summary the method consists of:

1. Penetrating the critical zones with a drilling fluid of lower resistivity than that of the water already in the formation.

2. Recording a series of lateral investigation curves which have a sufficiently shallow depth of penetration to record the resistivity of the formation which may have been invaded by the drilling mud filtrate.

3. The sands with resistivity sufficiently high to indicate the possible presence of oil should be inspected to see if the resistivity recorded by the very shallow curves has or has not been reduced by the loss of low-resistivity mud filtrate to the formation. If there is a wide and uniform separation it is highly probable that the sand contains primarily water. If the curves tend to group toward higher-resistivity values the sand is very likely an oil sand. The response of the detail resistance curve may be used to verify these observations. The data derived from the critical sands may be plotted and compared by the slopes of the initial portion of the curves.

4. The group of sands selected as possible oil sands should be graded by comparing their true resistivities to discard those which may be silts.

Logging in Oil-Base Drilling Fluids

The increased use of oil-base drilling fluids in California has placed severe demands on electrical logging. However, the extensive use of these drilling fluids has been made possible through the success of electrical-logging techniques developed to meet this problem. The more recent advances in oil-base logging have been of a technical nature, a full discussion of which is beyond the scope of this paper. It is felt, however, that a brief consideration of the problems involved and the extent to which they have been solved is of use in evaluating these logs in comparison with those obtained in normal drilling muds.

Fundamentally, the problem of electrical logging in oil-base fluids is the same as for mud except for the magnitude of the resistance changes in the current circuit and the intermittent nature of the electrode contact to the formations. These factors arise from the fact that oil-base fluids are essentially very good electrical insulators and means other than the conventional exposed metal-band electrodes must be employed for imparting the electrical current to the formation. Investigation of the conditions imposed by oil-base fluids indicates that, in addition to the electrically nonconducting bore hole, there may exist an insulating filter cake and a relatively shallow zone of oil invasion into the formation, most of which must be penetrated by the electrode before satisfactory current transfer can be accomplished.

Of the several methods of making electrical contact with the formations which have been investigated, two have proved to be the most satisfactory. The earliest of these was a series of wires in the form of a circular brush. A large number of such wires scraping against the formation provide sufficient area of contact to permit an electrical current circuit to be established. A later device, and perhaps the more applicable of the two under extreme oil-filled borehole conditions, consisted of hardened cutting blades forced outward into the formation by positive spring pressure. The average magnitude and variations of the contact resistance presented by these electrodes was sufficiently high to override the ability of normal electrical logging circuits to establish essentially constant current in the formation, a prerequisite for accurate resistivity determinations.

It was discovered at an early date, however, that the measurement of the resistance at the contact electrodes bore a definite relationship to the formations. This is logically so

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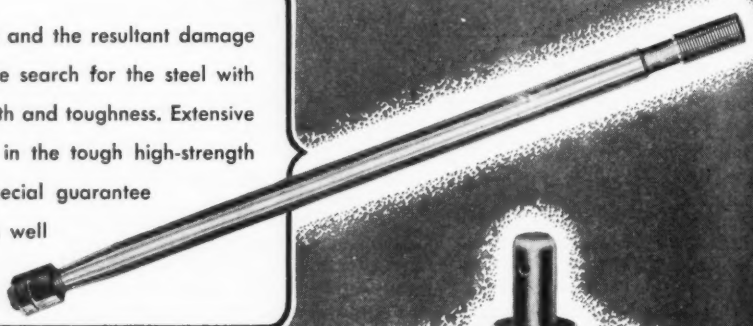

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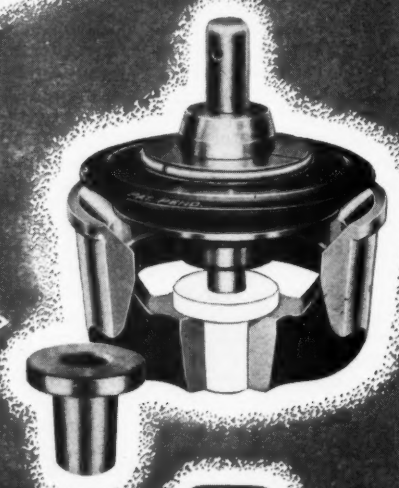

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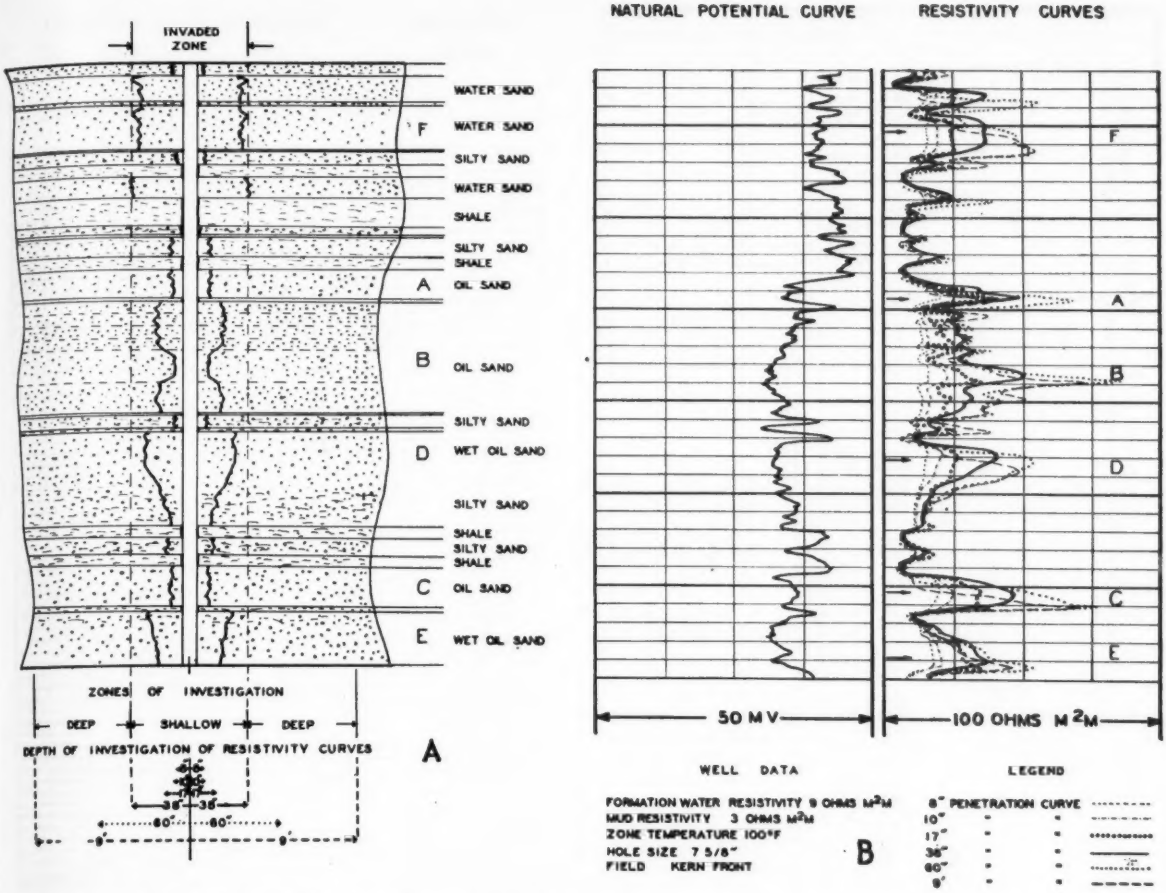


on the basis that the nonpermeable formations such as shale should make better electrical contact than permeable sands in which the oil invades a short distance. Early oil-base logs, therefore, were made up of a natural (self) potential curve and a resistance curve on which were superimposed the effects of random contact resistance. In early oil-base electrical logs the jagged nature to the curves resulted from the intermittent contact of the electrodes with the formation. In most instances these logs were capable of being used for correlative purposes but were inadequate for any form of interpretation other than distinguishing sands from shales. Their calibration also was in no way comparable to resistivity curves made under usual conditions.

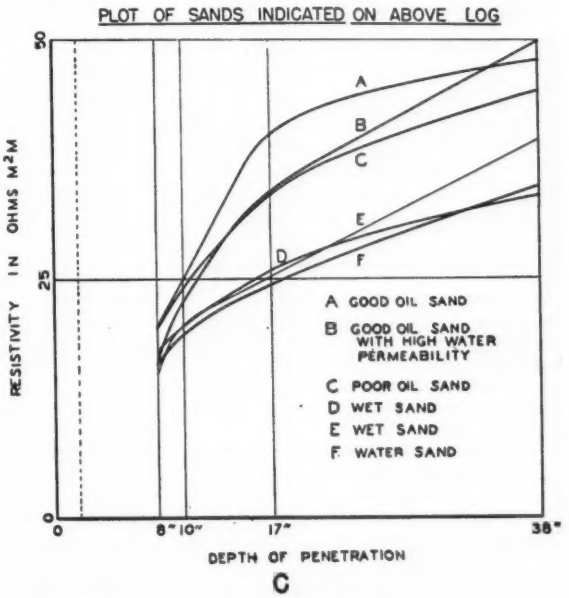
Improvement in oil base logs has centered around three approaches:

1. Reducing both the magnitude and intermittent nature of the electrical contact.
2. The design of measuring circuits capable of establishing essentially constant formation current over a wider range of resistance variations.
3. The incorporation of means for smoothing out the remaining effects of contact variation on the measuring circuit.

Since any number of contact cutters comprising one electrode may be joined in parallel electrically, the obvious approach to better contact for this type of device has been by increasing the number of cutters. For all practical purposes, however, mechanical design problems limit the number of cutters to a maximum of six or eight so that further improvement by this means appears limited. Further minor improvement has resulted from increasing the sharpness of the cutters to permit them to cut deeper into the formation.

Utilizing the advantages of the reduced contact resistance secured by such procedures, measuring circuits have been devised which are capable of maintaining essentially constant average current in the formation un-

Fig. 4—Diagram "A" (above) again shows the varying depth of invasion of mud filtrate in sands (ratio of resistivity of formation fluid to mud filtrate is 3 to 1). This is for another well in the same field represented in Fig. 1. Curves "B" (upper right) represent the actual electric log of the formations shown in diagram "A." Graph "C" is a plot of depth of penetration versus resistivity, for the sands covered by diagrams "A" and "B"



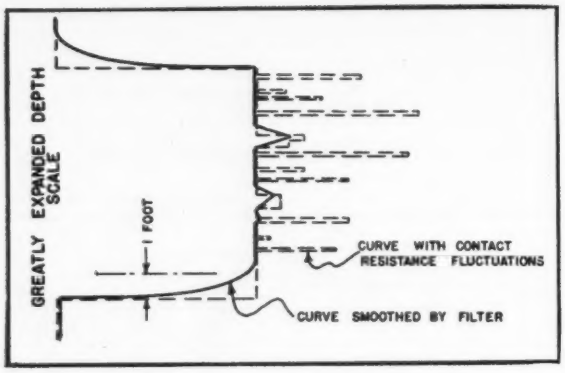


Fig. 5—(Above) Smoothing effect of filter on electric log made through oil-base mud

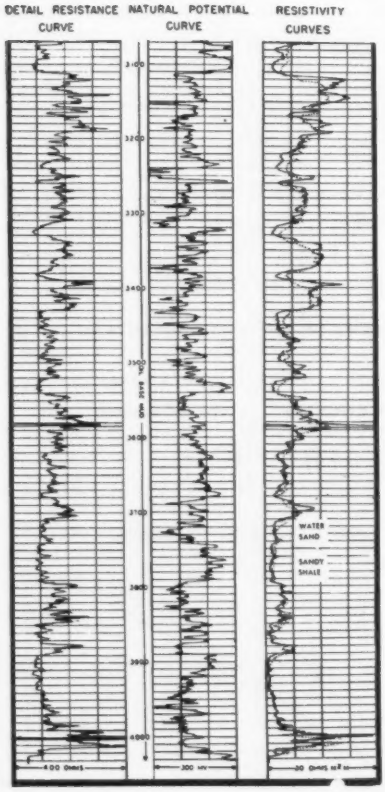


Fig. 6—(Left) Example of modern electric log taken through oil-base mud

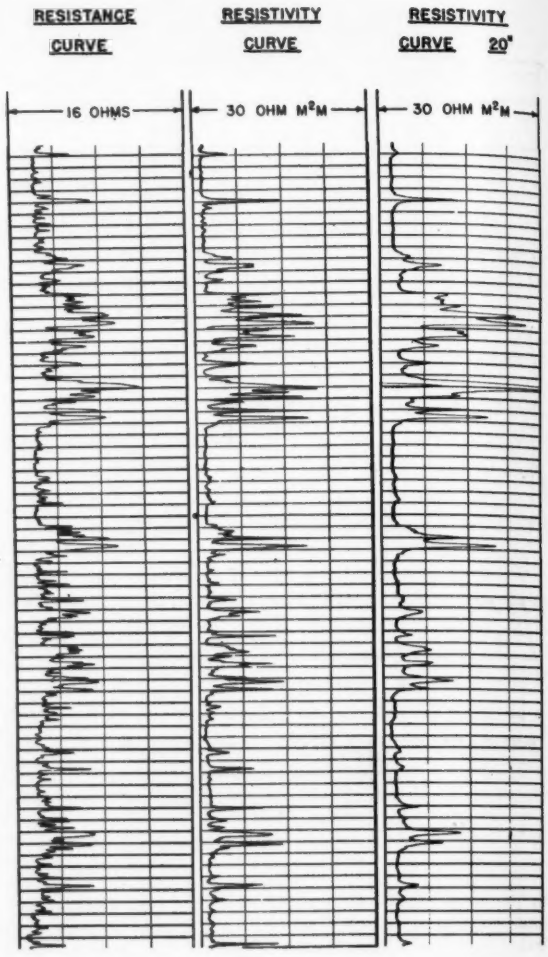


Fig. 7—(Right) Response of shallow lateral resistivity curve compared to the detailed resistance and averaging (normal) resistivity curves for a highly interbedded zone

der most bore-hole conditions. The attainment of relatively constant formation current has permitted the measurement of actual formation resistivity curves whose calibration is comparable with equivalent curves obtained in mud.

In spite of the reduced magnitude of the average contact resistance, the smallest instantaneous variations which have been attained to date are still from 10 to 20 times the maximum experienced in mud logging. Such relatively instantaneous variations are of sufficient magnitude to produce a very jagged appearing log. A significant improvement in both the accuracy and appearance of oil base logs has resulted from the use of electrical filters designed to smooth out these extraneous fluctuations. Investigations have shown that these sharp fluctuations occur with a rapidity corresponding to an inch or two of electrode travel. Since the smallest significant detail on the curve may be considered to be of the order of 1 ft., the use of a suitable electrical smoothing filter can accomplish the effectual elimination of the unwanted extraneous fluctuations without disturbing the useful character of the curve. A filter designed such that the galvanometer response to an instantaneous surge is 90 per cent of the peak magnitude of the surge in a time corresponding to 1 ft. of cable travel will effectively accomplish this end. Fig. 5 is an idealized representation of the manner in which such a filter smooths out the meaningless variations with negligible distortion of the true character of the curve.

Experience gained in oil base logging indicates that a wide variety of bore-hole conditions may exist as a result of the nature of the particular oil base fluid, the formations involved, etc. It has, therefore, proved of value to continue to record the curve which reflects the actual resistance between the current contact electrodes and the formation. (Left-hand curve in Fig. 6.) This curve serves two purposes:

1. As a result of the normally experienced shallow invasion of the oil-base fluid into permeable formations, all resistivity curves having depths of lateral penetration of more than a very few inches become the equivalent of deep penetration resistivity curves (third or fourth curves). The resistance curve, therefore, becomes the closest approach to the shallow penetration (normal) curve and may serve the useful functions normally performed by this curve.

2. Under extreme conditions created by large bore-hole fluid invasion or enlarged bore-hole diameters, the constant current limitations of the apparatus may be partially exceeded. The resistance curve serves to indicate this condition and permits a correction factor to be derived which may be applied to all resistivity curves to correct their calibration into resistivity units. It is not necessary to apply such correction factors, in general, for formations showing resistance values below 1,000 ohms.

The interpretation of oil-base logs, now made possible through the full complement of curves, requires recognition of certain differences between these logs and normal mud logs. The natural or self potential

curve made in oil-base fluids appears to show more variation from field to field than when made in mud. The exact causes of this are still uncertain but a possible source of difference lies in potentials which may be set up between the contact electrode metal and the formation fluids. Because of these inconsistencies it is desirable to establish the response characteristics of each oil-base natural (self) potential curve to known sands and shales before proceeding with more exact interpretation.

The relatively similar response of most resistivity curves on oil-base logs is generally attributed to the fact that they measure the natural or uncontaminated resistivity of the formation beyond the invaded zone. These curves, therefore, are the equivalent of the deep penetration (lateral) curves of normal mud logs. The recognition of wet zones generally requires close inspection of the natural (self) potential and resistance curves to determine the exact extent of the sand bodies. This is illustrated on the log of Fig. 6 on which both resistivity curves show similar response to the zones marked "water sand" and "sandy shale." The distinction between these zones is brought out by inspection of the natural (self) potential curve which defines the extent of the water sand. The relatively low value of the resistance curve over the wet zone indicates that the bore-hole fluid invasion has not displaced all of the interstitial water from the sand.

Shallow Lateral Resistivity Curves

The need for recording curves to meet certain specific bore-hole and formation conditions is an ever-present problem. In certain California fields, for example, electrical logs are called upon to represent accurately highly interbedded oil sands, shales, and other formations ranging in thickness from 6 in. to several feet. The ability of curves of the detail (bridge) resistance type to respond to such thin formations has proved of value in making sand counts and in the accurate determination of formation interfaces. The response of such curves to changes in shale character and bore-hole diameter is also frequently of use for correlation in critical or long shale sections. However, resistance curves are necessarily measured in units of ohms and their response is not directly comparable to the more familiar curves calibrated in resistivity units (ohm m²m). The 10 and 20-in. averaging (normal) resistivity curves show greatly reduced response to shale and bore-hole variations but average out this fine stratigraphic detail.

In highly interbedded formations there are frequent instances where it is helpful to combine the merits of the detail resistance curve in defining thin formations with the resistivity (ohm m²m) calibration and reduced response to shale and bore-hole variation of the averaging (normal) resistivity curves. This need has been satisfied by recording a close-spaced, double-pickup-type curve, termed a shallow lateral resistivity curve, which has an effective depth of penetration of 17 in. Fig. 7 shows the response of this shallow lateral resistivity curve compared to the detail resistance and averaging (normal) resistivity curves (20 in.) in a highly interbedded zone. The response of this new curve to thin beds can be seen to approach that of the detail resistance curve with considerably reduced susceptibility to shale variations and bore-hole diameter changes. The curve calibration is in resistivity units facilitating direct comparison with other resistivity curves.

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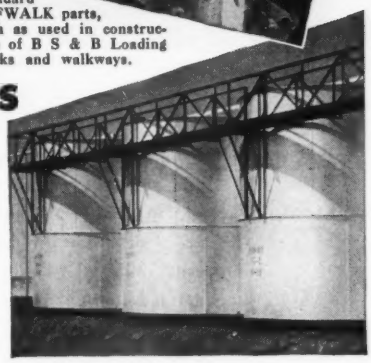

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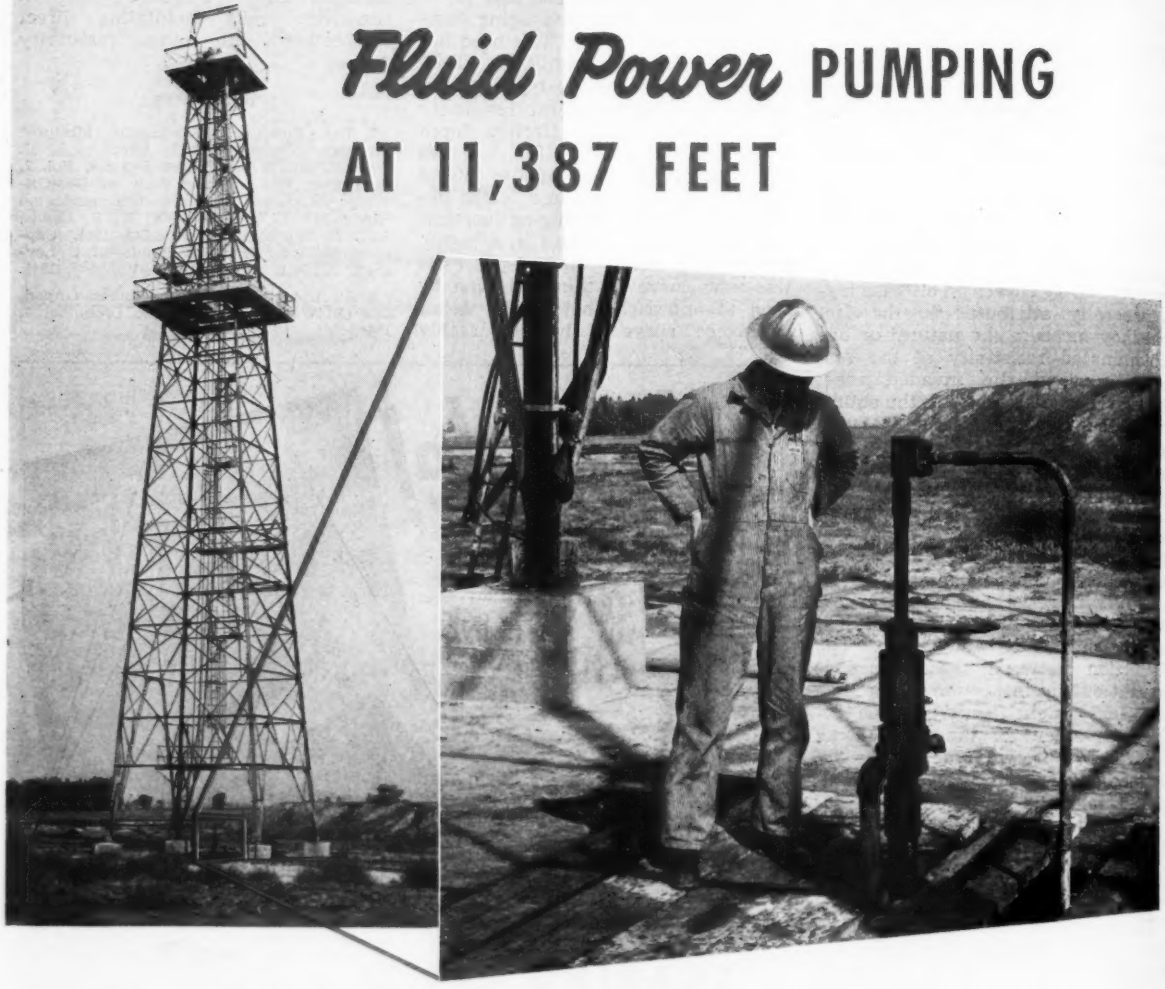
Fluid Power PUMPING AT 11,387 FEET



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PUMP THE MODERN WAY—USE KOBE

Converted U. O. P. Isomerization Unit Now Makes Polymer Gasoline

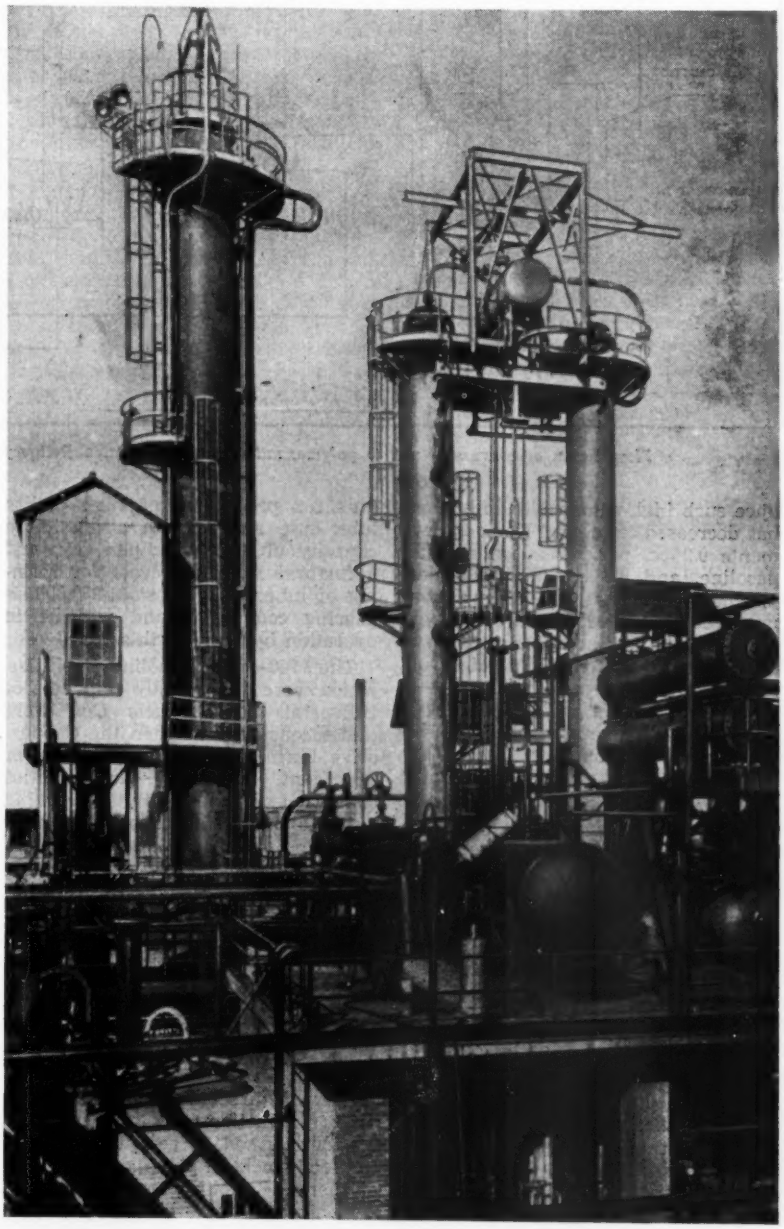
by Louis C. Brown

EVERY day in the plant of the Cooperative Refinery Association at Coffeyville, Kans., a former butane isomerization unit which had played an important part in the production of 100-octane gasoline during the war years, is now operating in the peacetime role of producing high-grade motor gasoline. Converted to a U.O.P. polymerization unit nearly a year ago, it has been averaging a daily make of 150 bbl. of 10-lb. R.v.p. polymer gasoline. This represents a conversion to gasoline of 300,000 cu. ft. of cracked gases formerly burned as refinery fuel.

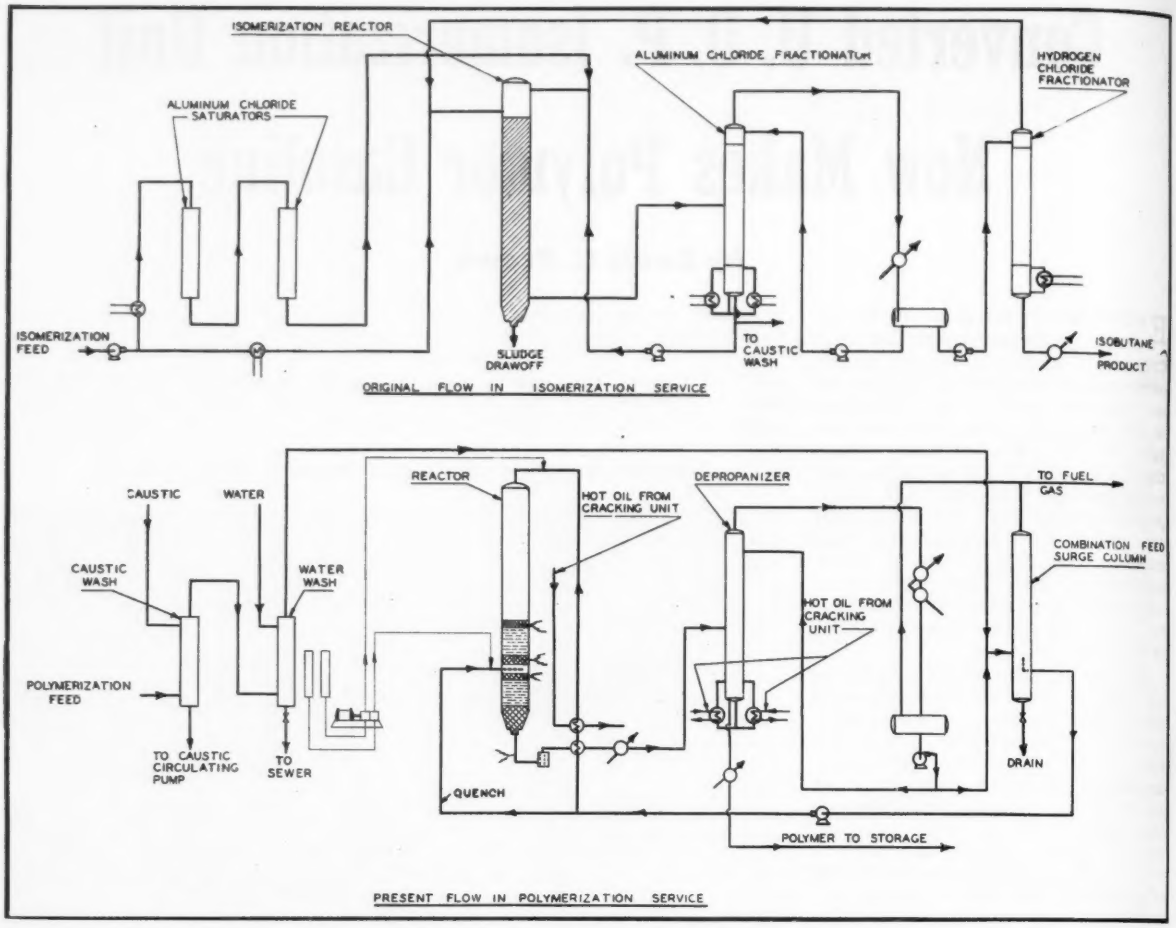
The butane isomerization unit, an element of the government-owned 100-octane facilities, which were operated as an integral part of the refinery during the war, was readily adapted to its new service by a few simple changes. Cost of the job was about $18,000, and the work was done by the refinery maintenance department in 3 weeks. Construction cost of a new polymerization unit to produce the same results would approach $100,000 under today's conditions, but it is doubtful that construction could be completed under 6 months, due to material shortages. The cost of conversion has been paid out in a very short period of operation.

The polymer gasoline has an A.S.T.M. clear octane rating of 82.0, and a Research clear octane rating of 95. Its A.S.T.M. blending octane value has been determined at 89 in thermally cracked gasoline, whereas, with straightrun gasoline from Mid-Continent crude oil, it has a blending value of 100 A.S.T.M. octane rating. Since it is possible to use all excess butane for vapor-pressure requirements, the added volume of gasoline provided by the polymerization is about 3.5 per cent, based on the thermal cracking charge, or 6.0 per cent when based on 10-lb. R.v.p. cracked gasoline. The ability to pro-

Converted polymerization unit in plant of Cooperative Refinery Association



Louis C. Brown joined Cooperative Refinery Association in 1944, as process engineer, over alkylation and isomerization units. In 1946, he was appointed chief refinery engineer for C.R.A.'s three refineries, the position which he holds at the present time. He is a graduate of University of Notre Dame, and was formerly with National Refining Co., Findlay, Ohio, in the operations department.



Flow charts of conversion unit to polymerization unit, Cooperative Refinery Association, Coffeyville, Kans.

duce such high-octane blending stock has decreased tetraethyl lead requirements 0.2 cc. per gallon on regular gasoline, and 0.3 cc. per gallon on premium-grade gasoline as are now produced in the Mid-Continent area. Further, our laboratories have shown that a blend of 290° e.p. straightrun gasoline, and polymer gasoline in a volume ratio of 74 to 26 will yield a finished 10-lb. R.v.p. gasoline of 84.0 A.S.T.M. octane number (3 cc. TEL per gallon).

The conversion of the isomerization unit is but one of the postwar steps in the program of improvement that began when the Cooperative Refinery Association bought the Coffeyville refinery from National Refining Co. on January 1, 1944.

At that time, the operating facilities consisted of a two-stage crude-distillation unit, with a rated capacity of 13,500 bbl. per day, a U.O.P. two-coil thermal cracking unit, with a capacity of 4,200 bbl. per day, and a complete lubricating-oil and wax plant. Modernization, expansion, and replacement of old equipment have gone ahead as rapidly as material, supplies, and wartime regulations permitted. A new vacuum-distillation unit for production of high-quality lube base stocks, with a maximum capacity of 4,500 bbl. per day, and a furfural solvent process for refining of lube oils, to cost $1,250,000, is nearing completion and will be in operation by June of this year.

The 100-octane-gasoline facilities, which were designed by engineers of Universal Oil Products Co., were under construction when the Cooperative Refinery Association took over the plant. Essentially, the facilities consist of a fluid catalytic cracking unit, with a design capacity of 3,900 bbl. per day, an HF alkylation unit, with a production capacity of 1,500 bbl. per day, the isomerization unit, rated at 300 bbl. per day, together with a complete gas-concentration unit, utilities, blending facilities and tankage.

High-Octane Plant

The high-octane plant was put in operation in May 1944, when all efforts were directed towards the maximum production of aviation gasoline for our armed forces. To augment the feed stock for the alkylation unit, a thermal naphtha reforming furnace, capacity 1,500 bbl. per day, was erected and operated as a part of the thermal cracking unit.

After V-J Day, the government-owned facilities were shut down, inspected, and placed in a standby condition. At this time, the management, which had been studying the situation in advance, elected not to negotiate for the purchase or lease of the catalytic cracker or any part of the high-octane facilities, but to rely on the thermal cracking unit as the heart of the light-oil operation until a more stable picture of future gasoline-market requirements presented itself.

The thermal cracking unit is flexible and efficient, usually requiring but three cleanouts per year. The charging stock ranges from reduced crude of 25° A.P.I. gravity to a mixture of gas-oil-reduced crude of 31° A.P.I. At present the unit is running about 3,900 bbl. per day of 30° A.P.I. charge stock. For a period of 2 months during the past year an excess of gas-oil charging stock was cracked by single pass through the reforming furnace, at which time total cracking charge to the unit was 5,700 bbl. per day. More recently, the demand for lube

oils has decreased the amount of reduced crude available for the thermal cracking unit, resulting in a low volume charge.

During the fall and winter of 1945-46, study of the thermal cracking operation indicated that the amount of butane-butylene lost to fuel gas, even though stabilizing to winter specifications on vapor pressure, was by no means a negligible factor. Looking ahead to summer vapor-pressure requirements, and as a consequence increased gallonage of gasoline lost as fuel gas, the refinery management decided to utilize the gas for production of additional gasoline. Having had considerable experience with the advantages offered by a U. O. P. polymerization unit, and its low-cost operation, the refinery engineering department made a complete analysis of the isomerization unit and laid out the revamping details. U.O.P. engineers were requested to study the proposed changes and make further recommendations.

Results of this survey showed that the isomerization unit could be readily converted to a polymerization unit at small cost. Negotiations between Cooperative Refinery Association and Reconstruction Finance Corp. were begun, and resulted in leasing of this unit. More recently, the association purchased the government-owned high-octane facilities for $1,200,000.

Isolated Location

Because of the isolated location of the isomerization unit and the inadequate steam supply, it was decided to use hot oil from the thermal cracking unit for preheating the combined poly feed and for supplying heat to the depropanizer reboiler. Erection of nearly 1,500 ft. of 4-in. insulated oil line from the thermal cracker and return constituted the main item of expense in making the conversion.

The feed is obtained as liquid from the cracked gasoline stabilizer, which normally produces a 4-5-lb. R.v.p. gasoline. The absorber and stabilizer are doing an excellent job of recovering approximately 95 per cent of the butane-butylene fraction and up to 30 per cent of the propane-propylene fraction. The liquid condensate is charged to the feed-preheating system at the poly unit by pump, which is controlled by level in stabilizer overhead receiver. Liquid volume is measured as it enters poly plant by flow recorder.

The aluminum chloride saturators, which have been filled with Raschig rings to insure good contact, are used as caustic-wash and water-wash columns for pretreatment of feed. The former hydrogen chloride recovery column is utilized as a surge column to handle combined recycle and fresh feed. The suction riser has been extended above the combined feed inlet to permit a small interval of settling time for any water that may have been carried out of the fresh feed-water was column. This column also provides for short shutdown periods without cutting down poly feed production at the thermal cracking unit stabilizer, as well as retaining low-olefin-content recycle, during the thermal cracker shutdown, thus eliminating possible damage to catalyst by starting up on fresh feed.

The isomerization reactor was found to be good for temperature and pressure conditions required to promote the polymerization reaction, and hence it was adapted to a poly reactor. Two catalyst beds were installed in the column and filled with solid phosphoric acid catalyst over a supporting bed of crushed fire brick. The upper two-thirds of the column is vapor space. The combined feed is brought into the reactor and by means of an internal vertical line is discharged above the first bed. In the space between the two beds is a distribution ring for quench inlet and to promote rapid mixing of the quench with first bed effluent.

The former isomerization charge pump was found to be too small for combined feed, and permission to use the alkylation motor-driven gland-seal pump was given by government representatives at Coffeyville. It was a relatively simple job to adapt it to pumping the light material. Four G-fin sections are used to exchange heat between combined feed and reactor effluent. Final preheat of the feed is obtained in four G-fin sections by use of the hot oil from the thermal cracker. A temperature controller regulates the oil flow to the preheater. A part of the combined feed bypasses the preheaters to serve as quench between the two catalyst beds for control of the temperature increase due to the exothermic reaction.

The former aluminum chloride column is now in service as the polymer gasoline stabilizer. The condensers, receivers, and reflux pump were adapted to the new service without change. However, since this system has a spare reflux pump, it was decided to so manifold the two with the charge pump, that one could spare either of the two duties.

Flow Through Unit

Flow through the unit is as follows: Fresh feed enters the unit through the feed pretreatment section and into the combined feed surge drum. Recycle is added to the fresh-feed line upstream to the surge-drum inlet, to provide proper mixing. With the flow of both streams being recorded, it is comparatively simple to control the recycle to fresh feed ratio to produce a combined feed of 18-19 per cent olefin content. Pretreatment of the feed consists of a countercurrent caustic wash and a countercurrent water wash. A duplex pump is used to circulate caustic, and a plunger-type pump continuously adds fresh caustic.

TABLE 1—YIELDS FROM CRACKING AND POLYMERIZATION

Charge—	Bbl. per day	Vol. %
Reduced crude-gas oil mix	3,900	100.0
Yield—		
Residuum	1,053	27.0
Stab. gasoline—5.5 lb. R.v.p.	2,176	55.8
Butanes	156	4.0
Poly gasoline—2 lb. R.v.p.	137	3.5
Gas and loss	378	9.7
Fuel gas	1.9×10^6 SCF	
A.P.I.°	61	
R.v.p.	10	
A.S.T.M. clear	72.3	
+ 3 cc.	79.9	

TABLE 2—TYPICAL ANALYSIS OF POLYMERIZATION STREAMS

	Fresh feed, Mol per cent	Fuel gas, Mol per cent	Finished Poly gasoline, liquid per cent
H_2	Trace	Trace	....
C_1	0.9	9.7	....
$= C_2$	1.4	7.9	....
C_2	8.1	30.3	....
$= C_3$	16.5	4.1	0.3
C_3	22.9	46.5	1.2
$= C_4$	28.1	0.5	7.5
C_4	21.0	1.0	44.0
C_5—115°	1.0	....	2.7
115°—e.p.	....	....	44.3
Sp. gravity—115°—e.p.	....	....	0.735

The results from feed pretreating are very good. Tutweiler analyses on the fresh feed have ranged from 100 to 125 grains of hydrogen sulfide and mercaptans per 100 cu. ft. After scrubbing, the feed contains 10-15 grains. Mercaptan content of the finished poly gasoline is 0.0009 per cent. With this low figure, the poly gasoline is blended back with stabilized gasoline after the latter has been through the doctor-treating unit.

The pumps that supply water for hydration of the catalyst are connected to the same drive shaft as the caustic makeup pump. Water is added to the combined feed after it leaves the preheaters for the first bed of catalyst. Hydration of second bed is performed by introduction of water between the two beds along with the quench.

From the surge drums, the feed is charged through the preheaters to the reactor. The effluent from the reactor bottoms passes through a filter pot to remove any entrained catalyst fines. Leaving the filter pot, the effluent exchanges heat with the combined feed, passes through two sections of the watercooled G-fins, then enters the depropanizer column.

The overhead from the column is cooled sufficiently to condense liquid reflux and recycle, the excess gas being released through a pressure-control valve into the fuel-gas system. Both the vertical reboilers are in use on the depropanizer using the thermal cracking hot oil as a heating medium. Poly gasoline of 35-40 lb. R.v.p. is drawn from the bottom of the depropanizer column by level

control. It is cooled in four sections of water-cooled G-fins before being sent to storage with the cracked gasoline.

Yields and character of products are shown in Table 1.

The unit was placed in operation on April 28, 1946. After 2 days of circulation and checking of equipment, flow was cut through the reactor and the first poly gasoline was produced.

Podbielniak analysis of the feed and products of the polymerization unit are shown in Table 2.

At the present writing, the unit has produced 117 gal. of poly gasoline per pound of catalyst, and it appears that catalyst life will approach 150 gal.

The long catalyst life during the present run may be attributed to a proper recognition of the many reactant variables by the operating personnel, and unusually complete instrumentation. The olefin content of the combined feed, governed by the recycle, seldom varies from the 18-19 per cent. The space velocity, important in promoting sufficient reaction time for optimum conversion with a minimum exposure of polymer gasoline to the catalyst, has been maintained by keeping the combined feed charge substantially constant. Reactor temperatures were kept to a minimum. The fresh feed is constantly checked for pentane fraction and caustic or water carryover. It is also felt that the care used in charging catalyst to the tower has materially aided in keeping down pressure drop.

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BOOKS

PHYSICAL CONSTANTS OF HYDROCARBONS. Vol. IV, Polynuclear Aromatic Hydrocarbons. By Gustav Egloff, American Chemical Society Monograph Series, Reinhold Publishing Co., New York. 540 pp. $17.50.

"A collation of all melting point, boiling point, density, and refractive index data" on polynuclear aromatic hydrocarbon compounds is the author's own description of this volume. The author devotes much space to structural formulas of the various individual hydrocarbons, most of them of extremely complex structure. Outstanding in the volume is the extensive information available on the simpler of the products, such as the benzocyclanes, C_nH_{2n-8}, and those of the C_nH_{2n-12} group which includes indene and its derivatives such as the alkenyl side chain hydrocarbons. The table of contents includes the polynuclear compounds of empirical formulae as high as C_nH_{2n-48}, the last-named containing 12 benzene nuclei, being a substituted naphthacene, or anthracene with three phenyl and three diphenyl side chains.

Pyrene and anthracene and their involved substituted derivatives are given considerable attention although on many of them the data in the literature are necessarily scant. In fact the book illustrates clearly and forcibly the scarcity of data in these more complicated hydrocarbons, and the extreme need for more information on them, for the use of researcher and industry. The literature has been combed thoroughly, it appears without checking meticulously the huge number of references included. As a source book for fundamental data, and far more as a compilation of many important references for the research chemist, the volume is a monumental work which has accomplished a most desirable if onerous and exacting job much needed by laboratory and industry alike to bring together very widely scattered knowledge in short compass for the convenience of all concerned. Noteworthy, for example, are the references to substituted butadiene and other diolefins, such as 1-(2′-phenanthryl)-butadiene-1,3; this type of compound may be of more than passing interest to pharmaceutical, dye, and rubber chemistry.

STANDARD METHODS FOR TESTING PETROLEUM AND ITS PRODUCTS. Eighth Edition. Published by The Institute of Petroleum. 26, Portland Place, London, W. I., England. 576 pp. 17s.6d. (Obtainable also from A.S.T.M., 1916 Race Street, Philadelphia).

Eight new methods are included in this new edition. These comprise procedures for the estimation of metals in unused lubricating oils, methods for examination of the tendency of grease to corrode copper, and of the resistance of oxidation of turbine oils, a method for the determination of the flash point of liquid asphaltic bitumen, and a modification of the Schwartz method of estimation of tetraethyl lead in motor fuel. More or less extensive amendments have been made to 15 of the previous methods. A few minor amendments have been made to the two methods for determining knock rating of aviation fuels (weak mixtures) and of motor fuels. (I.P. motor method). The bromination method for determination of tetraethyl lead in motor fuel has been withdrawn from the new edition, in view of the availability of more rapid and reliable methods.

A General Pressure-Volume-Temperature Correlation—for Mixtures of California Oils and Greases

by M. B. Standing

SOLUTION of reservoir-performance problems requires that the physical properties of the reservoir fluids be known. These properties may be determined in the laboratory either from bottom-hole samples or from proper recombination of surface trap samples. Where the results of laboratory tests are not available, however, the physical properties must be estimated from field measurements. The purpose of this paper is to give the results of several correlations between the physical properties normally measured in the field and the physical properties necessary for the solution of reservoir performance problems. Other correlations of this type have been reported by Gosline and Dodson[1] and by Katz.[3] Sage and Olds[4] have reported recently an excellent correlation of formation volumes of condensate systems.

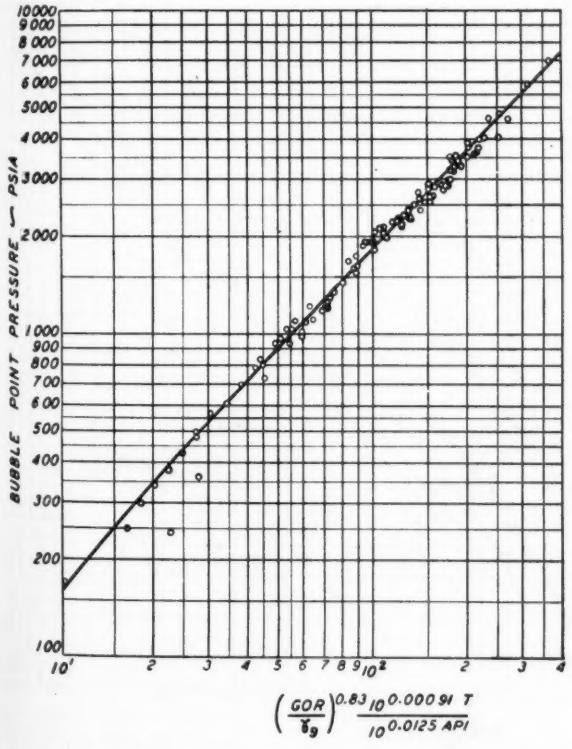
Accuracy of the following general P.V.T. correlations is restricted by two factors. First, the varied and complex multicomponent hydrocarbon systems which are dealt with are defined by only three simple parameters: gas gravity, oil gravity, and gas-oil ratio. Second, these parameters themselves depend upon the process by which the oil and gas are separated. The method used by Sage and Reamer[2] in the Rio Bravo field studies of specifying hexanes and heavier material as "oil" and all pentanes and lighter material as "gas" would overcome these difficulties. However, this approach does not lend itself to field usage.

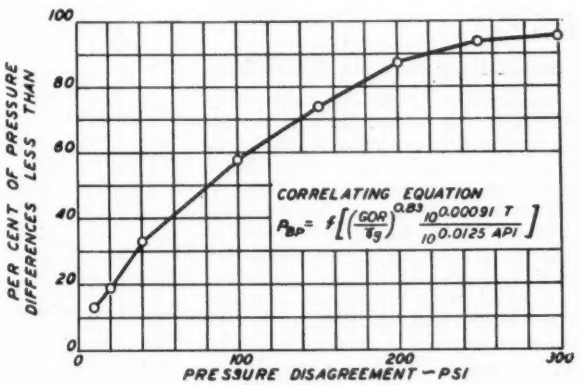
A further aid to preparing correlations would be to make use of a standard procedure in separating the oil and gas when determining gas-oil ratios. However, as the P.V.T. data are prepared for individual field conditions it is normally not possible to use such a method.

The gas-oil ratios, gas gravities, oil gravities, and formation volumes presented in this paper are laboratory

M. B. Standing was graduated by University of Utah with a B.S. in chemical engineering in 1936. He did graduate work in chemical engineering at University of Michigan and was granted the degrees of master of science in 1937 and doctor of philosophy in 1941. Employed by Standard Oil Co. of California in 1941, he has been in charge of the production technology laboratory at La Habra since 1943.

This paper was presented at the spring meeting of the Pacific Coast district, Division of Production, American Petroleum Institute, Los Angeles, May 15-16.





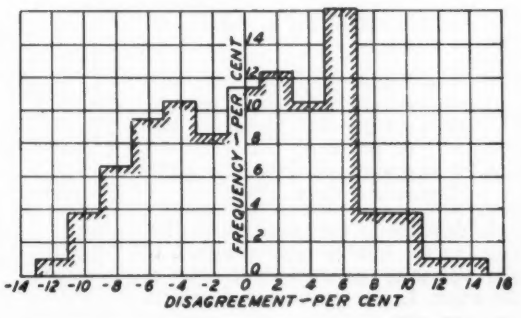


Fig. 1—(Left) Prediction of bubble-point pressure from gas-oil ratio, solution-gas gravity, tank-oil gravity, and temperature. Fig. 2—Frequency distribution of bubble-point pressure correlation

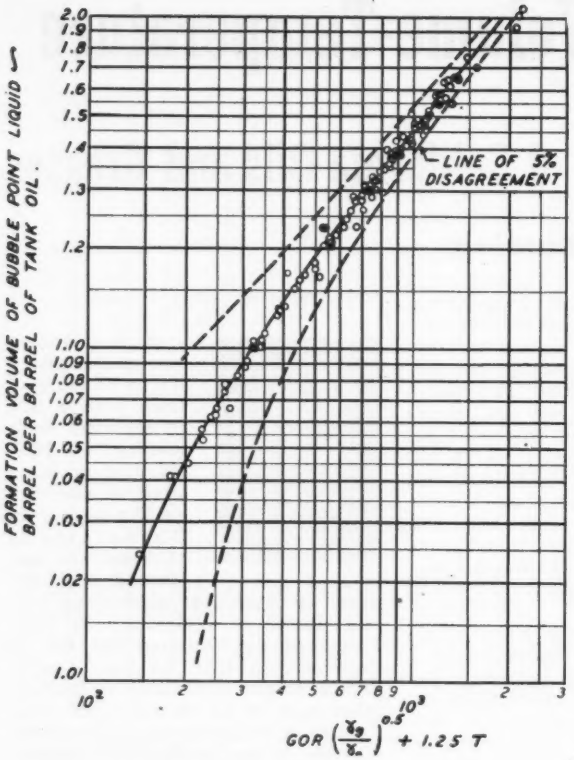

FORMATION VOLUME OF BUBBLE POINT LIQUID ↓ BARREL PER BARREL OF TANK OIL.
LINE OF 5% DISAGREEMENT
GOR $\left(\frac{\gamma_g}{\gamma_o}\right)^{0.5}$ + 1.25 T

Fig. 3—(Left) Prediction of formation volume of bubble-point liquid from gas-oil ratio, solution-gas gravity, tank-oil gravity, and temperature

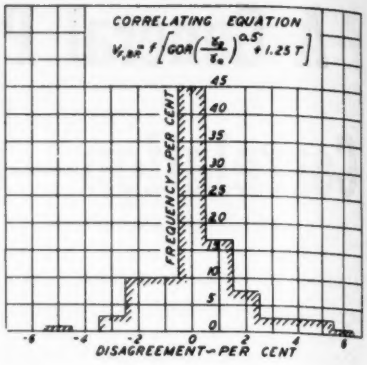


Fig. 4—(Right) Frequency distribution of bubble-point formation volume correlation

values. They are the result of a two-stage flash separation at 100° F., the first stage normally being within the pressure range of 250 to 450 psi. and the second stage at atmospheric pressure. This procedure is considered to approximate the average California field practices.

Bubble-Point Pressure Correlations

One of the important functions of P.V.T. data is to indicate whether the reservoir oil is undersaturated or saturated, or whether free gas is being produced from the sands. This requires a knowledge of the gas solubility-bubble point pressure relationship of the oil and gases associated in the reservoir.

In considering the manner in which the several variables affect the bubble point pressure of a mixture of an oil and a gas, it seems reasonable to postulate a correlation of the form

$$P_{BP} = f\,(GOR, \gamma g, T, A.P.I.) \quad (1)$$

where

P_{BP} = bubble point pressure, psia.
GOR = gas-oil ratio, cu. ft. per bbl.
γg = gravity of dissolved gas, air = 1.
A.P.I. = gravity of tank oil, °A.P.I.
T = temperature, °F.

In developing the specific equation relating the bubble point pressure to the variables on the right side of Equation 1, the general relationship between the variables was used to suggest graphical methods of determining specific relationships. For example, the bubble-point pressure normally increases with an increase in gas-oil ratio. This suggests that $P_{BP} = f_1\,(GOR)^a$ or $P_{BP} = f_2\,(A)^{GOR}$. Likewise, the bubble-point pressure increases with an increase in temperature, but decreases with an increase in oil gravity (°A.P.I.) or gas gravity (Air = 1).

After a number of attempts, it was found that a plot of log (GOR/γg) vs. log P_{BP} resulted in a series of straight lines with an average slope of 0.83. Mathematically, this gave the relationship

$$(P_{BP})_{T\ A.P.I.} = a\,(GOR/\gamma g)^{0.83} \quad (2)$$

A second plot of

$$\log \frac{P_{BP}}{(GOR/\gamma g)^{0.83}}$$

vs. °F. also resulted in straight lines of nearly constant slope, or, expressed mathematically

$$\left[\frac{P_{BP}}{(GOR/\gamma g)^{0.83}}\right]_{A.P.I.} = b10^{cT} \quad (3)$$

Finally, a third correlation was made to determine the effect of oil

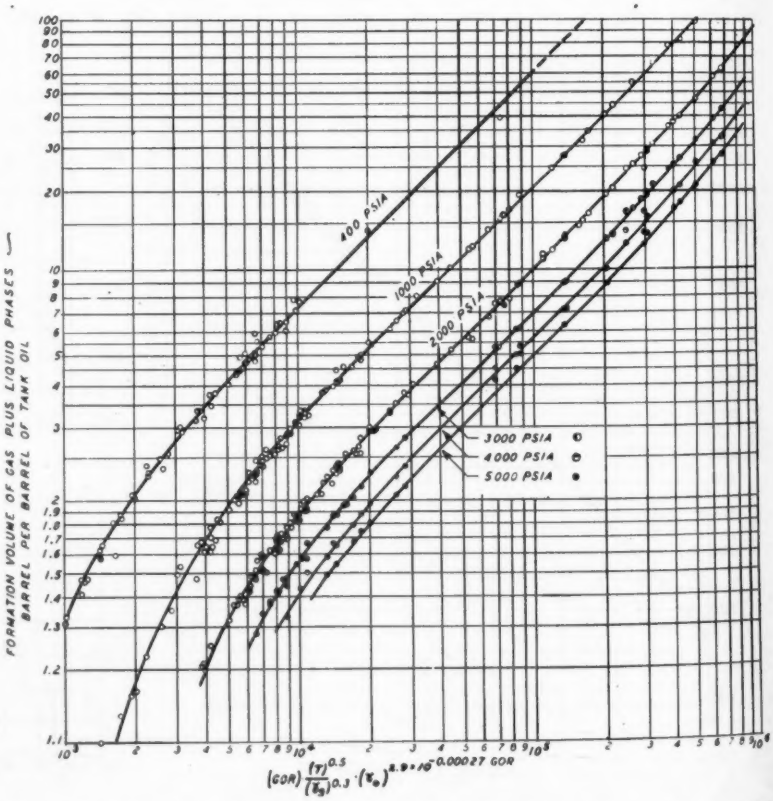


Fig. 5—Prediction of formation volume of gas plus liquid phases from gas-oil ratio, total gas gravity, tank-oil gravity, temperature, and pressure

gravity and the following specific relationship was obtained:

$$P_{BP} = f\left[\left(\frac{GOR}{\gamma g}\right)^{0.8} \cdot \frac{10^{0.0091T}}{10^{0.0125A.P.I.}}\right] \quad (4)$$

To obtain the relationships expressed in Equation 4, it was necessary to have tests on numerous mixtures of oil and gas over a wide temperature range. Fig. 1 shows the results of plotting 105 experimentally determined bubble-point pressures on 22 different crude-oil natural-gas mixtures. The range of the data was as follows:

Bubble point pressures, psia	130-7,000
Temperature, °F.	100-258
Gas-oil ratios, C.F.B.	20-1,425
Tank-oil gravities, °A.P.I.	16.5-63.8
Gas gravities (air = 1)	0.59-0.95

The agreement to be expected from the above correlation can be estimated from the curves shown in Fig. 2. The upper curve shows that 58 per cent of the points differed from the correlation by less than 100 psi. and that only 12 per cent were further than 200 psi. from the correlation. The lower curve gives the frequency distribution of the curves resulting from estimating the bubble-point pressure from the correlation. Over half of the experimental points were within 5 per cent of the correlation. The arithmetic average error was 4.8 per cent and 106 psi.

The data on 53 crudes reported by Katz[3] do not, when plotted as indicated in Fig. 1, give as good a corre-

(Continued on page 100)

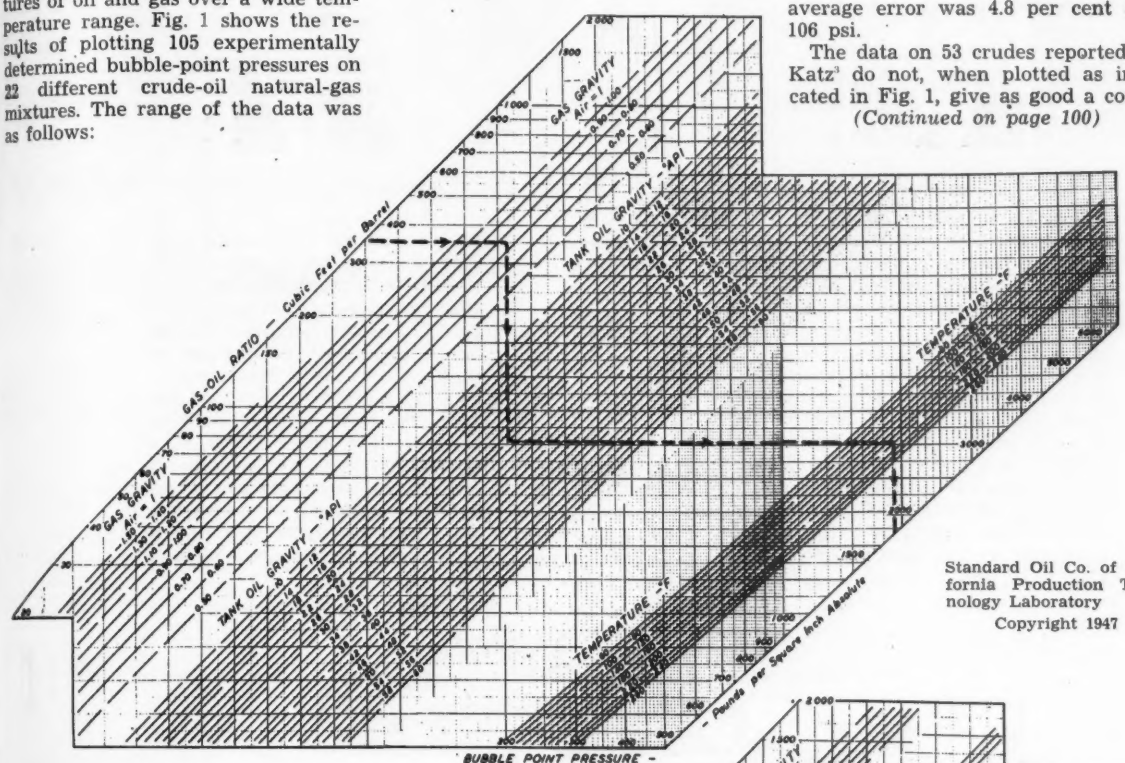

GAS-OIL RATIO — Cubic Feet per Barrel
GAS GRAVITY Air = 1
TANK OIL GRAVITY °API
TEMPERATURE °F
BUBBLE POINT PRESSURE — Pounds per Square Inch Absolute

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Fig. 7—(Above) Chart for calculating bubble-point pressure or solubility. Example: REQUIRED—Bubble-point pressure at 200° F. of a liquid having gas-oil ratio of 350 cu. ft. per barrel, a gas gravity of 0.75, and a tank-oil gravity of 30° A.P.I. PROCEDURE—Starting at left side of chart, proceed horizontally along the 350-cu.-ft.-per-barrel line to a gas gravity of 0.75. From this point drop vertically to the 30° A.P.I. line. Proceed horizontally from the tank-oil-gravity scale to the 200° F. line. The required pressure is found to be 1,930 psi.

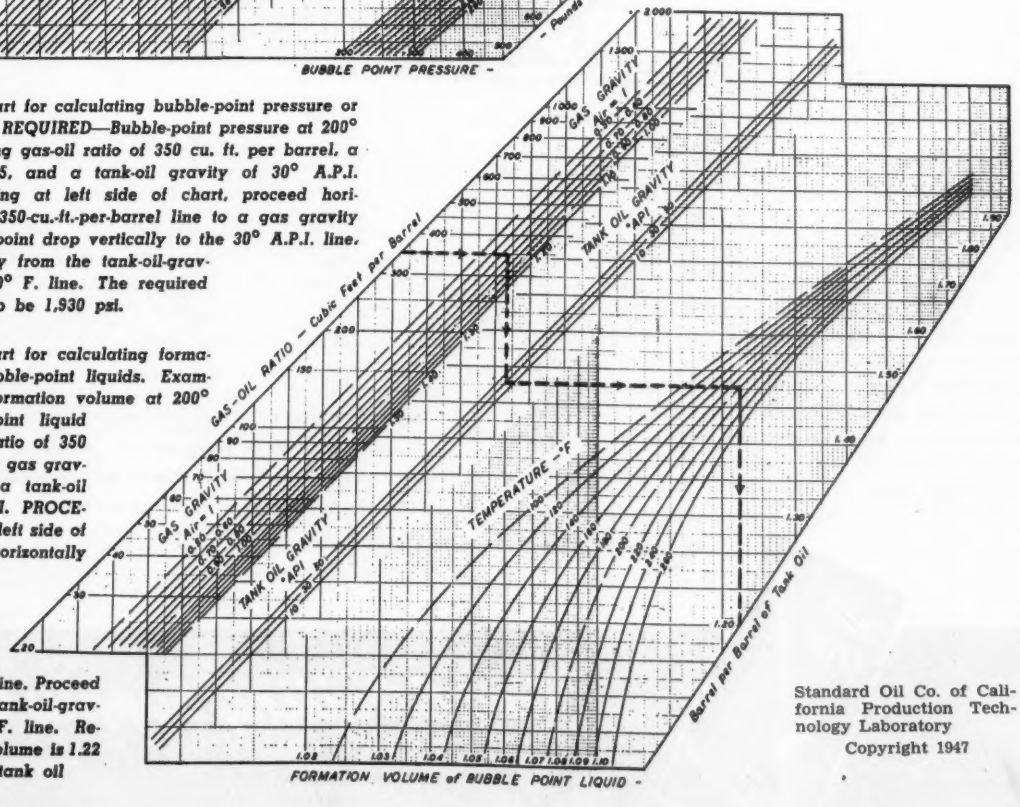
GAS-OIL RATIO — Cubic Feet per Barrel
GAS GRAVITY Air = 1
TANK OIL GRAVITY °API
TEMPERATURE °F
FORMATION VOLUME of BUBBLE POINT LIQUID — Barrel per Barrel of Tank Oil

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Fig. 8—(Right) Chart for calculating formation volume of bubble-point liquids. Example: REQUIRED—Formation volume at 200° F. of a bubble-point liquid having a gas-oil ratio of 350 cu. ft. per barrel, a gas gravity of 0.75, and a tank-oil gravity of 30° A.P.I. PROCEDURE—Starting at left side of the chart proceed horizontally along 350-cu.-ft.-per-barrel line to a gas gravity of 0.75. From this point drop vertically to 30° A.P.I. line. Proceed horizontally from tank-oil-gravity scale to 200° F. line. Required formation volume is 1.22 bbl. per barrel of tank oil

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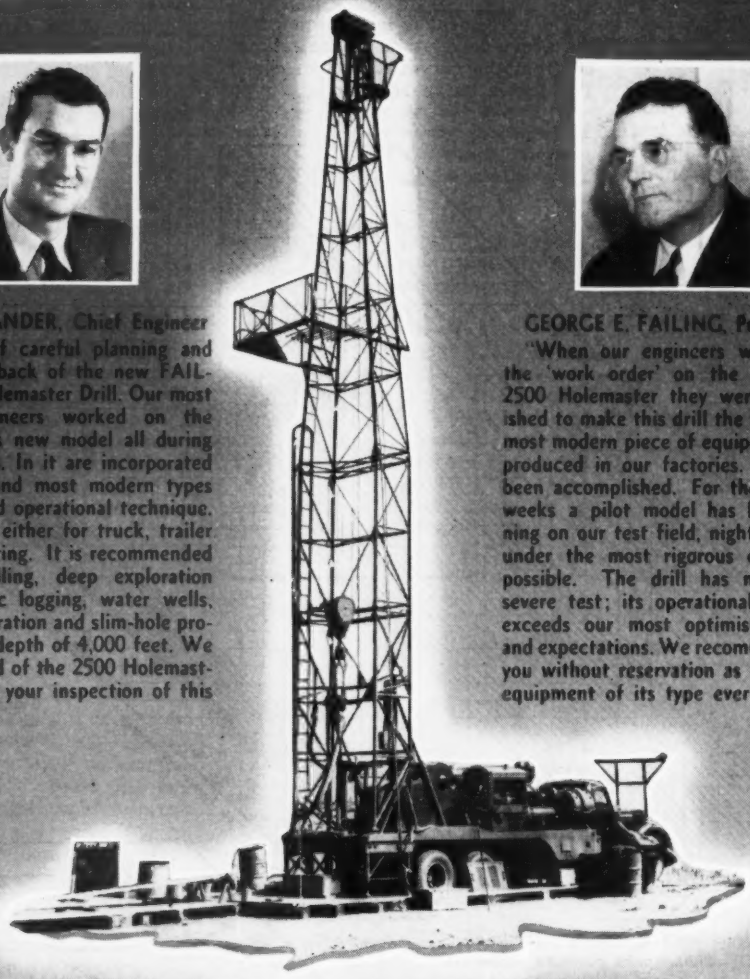

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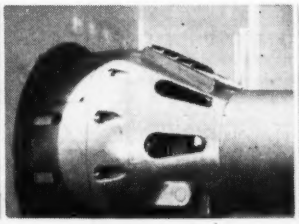

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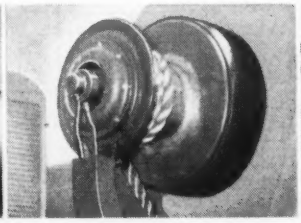

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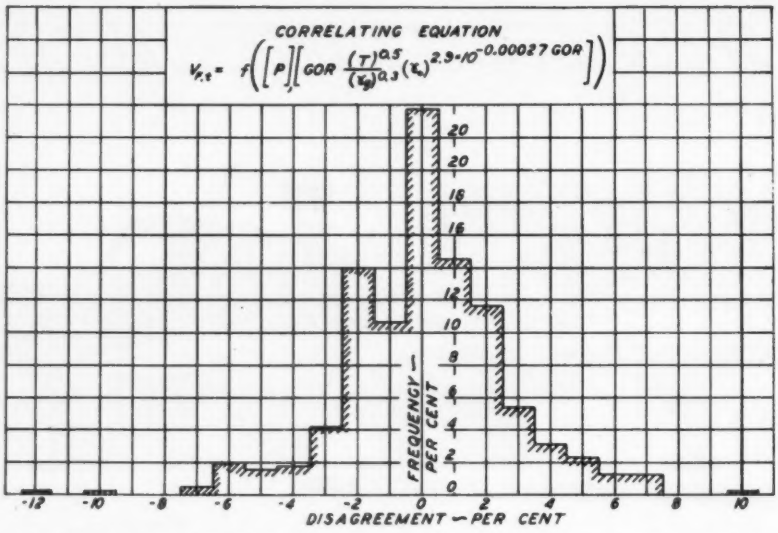


Fig. 6—Frequency distribution of gas plus liquid phases formation volume correlation

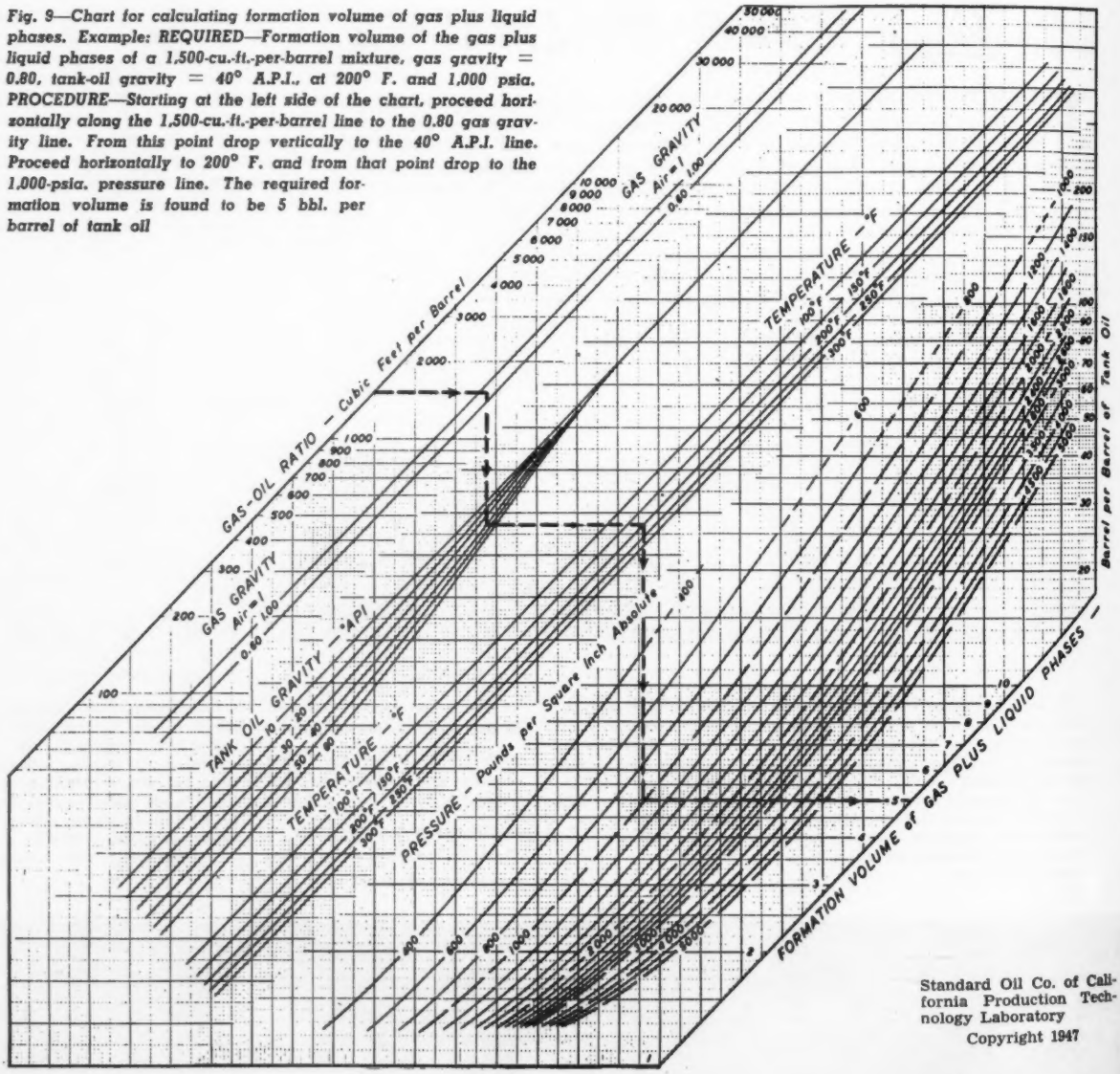
lation as the data reported in this paper. A line drawn approximately 150 psi. higher than that shown in Fig. 1 gave the best correlation of the Katz data. However, in terms of the present correlation, 52 per cent of the Katz data fell within 200 psi. of the correlation as compared to 88 per cent of the California data.

A better correlation obtained in the case of the California crudes is possibly explained by the fact that the crudes reported by Katz were from a larger variety of sources. Differences in laboratory methods, however, could account for part of the disagreement.

Formation Volumes of Bubble-Point Liquids

A second factor required in reservoir calculations is the formation volume of the saturated liquid phase. This factor is used to compute the shrinkage of the reservoir oil when

Fig. 9—Chart for calculating formation volume of gas plus liquid phases. Example: REQUIRED—Formation volume of the gas plus liquid phases of a 1,500-cu.-ft.-per-barrel mixture, gas gravity = 0.80, tank-oil gravity = 40° A.P.I., at 200° F. and 1,000 psia. PROCEDURE—Starting at the left side of the chart, proceed horizontally along the 1,500-cu.-ft.-per-barrel line to the 0.80 gas gravity line. From this point drop vertically to the 40° A.P.I. line. Proceed horizontally to 200° F. and from that point drop to the 1,000-psia. pressure line. The required formation volume is found to be 5 bbl. per barrel of tank oil


GAS-OIL RATIO — Cubic Feet per Barrel
GAS GRAVITY Air=1
TANK OIL GRAVITY — °API
TEMPERATURE — °F
PRESSURE — Pounds per Square Inch Absolute
FORMATION VOLUME of GAS PLUS LIQUID PHASES — Barrel per Barrel of Tank Oil

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it is processed to the stock tanks.

The formation volumes of the 105 bubble point liquids used in the previous section were correlated in terms of the gas-oil ratio, gas gravity, tank-oil gravity (specific gravity), and temperature. The correlating equation finally selected was

$$V_{F,BP} = f\left[GOR\left(\frac{\gamma g}{\gamma o}\right)^{0.5} + 1.25T\right] \quad (5)$$

where

$V_{F,BP}$ = formation volume of bubble-point liquid, bbl. per bbl. of tank oil
GOR = gas-oil ratio, cu. ft. per bbl.
g = gravity of dissolved gas, air = 1
o = sp. gr. of tank oil at 60° F.
T = temperature, °F.

Fig. 3 shows the results of plotting the experimental formation volumes against the function shown in Equation 5. To give an idea of the magnitude of the errors involved in the correlation, lines of 5 per cent disagreement are shown.

The frequency distribution of the errors is shown in Fig. 4. It will be noted that 45 per cent of the points fit the correlation with errors less than 0.5 per cent and that no errors were greater than 7 per cent. The arithmetic average of the errors is 1.17 per cent.

The shrinkage data presented by Katz, when converted to formation volumes, showed an arithmetic average error of 1.20 per cent when correlated by Equation 3. These close agreements indicate that the correlation of bubble point formation volume is more general than the bubble-point pressure, and that the correlations can safely be used for estimates on a wider variety of crude oils and gases.

Two-Phase Formation Volumes

The formation-volume data of the gas plus liquid phases cover a much wider range of gas-oil ratios than do the bubble-point pressure or bubble-point formation-volume correlations. This is because bubble-point liquids rarely have gas-oil ratios above 2,000 cu. ft. per barrel, while two-phase formation volume data are often required for mixtures having ratios as high as 100,000 cu. ft. per barrel.

A correlation based on the equation

$$V_{F,t} = f\left(P\left[GOR\frac{(T)^{0.5}}{(\gamma_g)^{0.3}} \cdot \gamma_o\, 2 \times 10^{-0.00027\,GOR}\right]\right) \quad (6)$$

where

$V_{F,t}$ = formation volume of gas plus liquid phases, bbl. per bbl. of tank oil
P = pressure, psia.
GOR = gas-oil ratio, cu. ft. per bbl.
T = temperature, °F.
γ_g = gas gravity, air = 1
γ_o = sp. gr. of tank oil at 60° F.

is shown in Fig. 5. This correlation contains 387 experimental points, 92 per cent of which are within 5 per cent of the correlation. The ranges of the data are as follows:

Pressure, psia.	400-5,000
Gas-oil ratio, cu. ft. per bbl.	75-37,000
Temperature, °F.	100-258
Gas gravity, (air—1)	0.59-0.95
Tank-oil gravity, °A.P.I.	16.5-63.8

The raising of the oil gravity to a power which in itself is a function of gas-oil ratio is a necessary feature of this correlation. This causes the tank-oil gravity to become relatively unimportant at ratios above 2,000 cu. ft. per barrel, which is in accordance with actual behavior of hydrocarbon systems.

Fig. 6 shows the agreement between experimentally determined formation volumes and the values obtained from the correlation.

At the time the correlations were prepared, the data of Sage and Olds[4] on high gas-oil-ratio mixtures were not available and therefore could not be used in preparing the correlations. A recent check with the Sage and Olds data showed that above 160° F. the correlations reproduced 58 experimental observations with a maximum error of 5.4 per cent and an arithmetic average error of 1.57 per cent. At 100° F. the errors amounted to as much as 11 per cent, the greatest error being noted in the case of the 5,000 psia. values.

Use of Correlations

The evaluation of bubble-point pressure, bubble-point formation volume, and two-phase formation volumes from the correlations presented in Figs. 1, 3, and 5 is somewhat laborious. In order to facilitate the use of the correlations, the calculating charts shown in Figs. 7, 8, and 9 were constructed. Examples of the use of each of the charts are indicated on the charts. From these charts it is possible to obtain quickly engineering estimates of the physical properties of multicomponent hydrocarbon systems under pressure and temperature conditions encountered in oil and gas-producing reservoirs.

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4. Volumetric Behavior of Oil and Gas from Several San Joaquin Valley Fields, B. H. Sage and R. H. Olds, A.I.M.E. fall meeting, Los Angeles, 1946.

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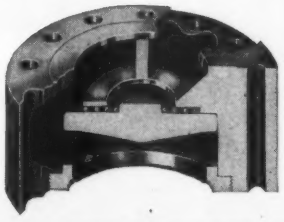

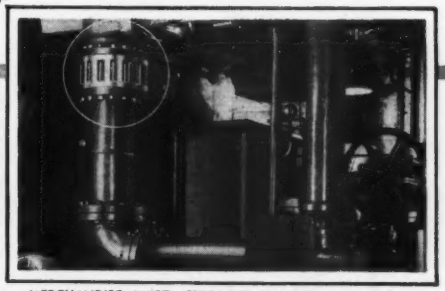

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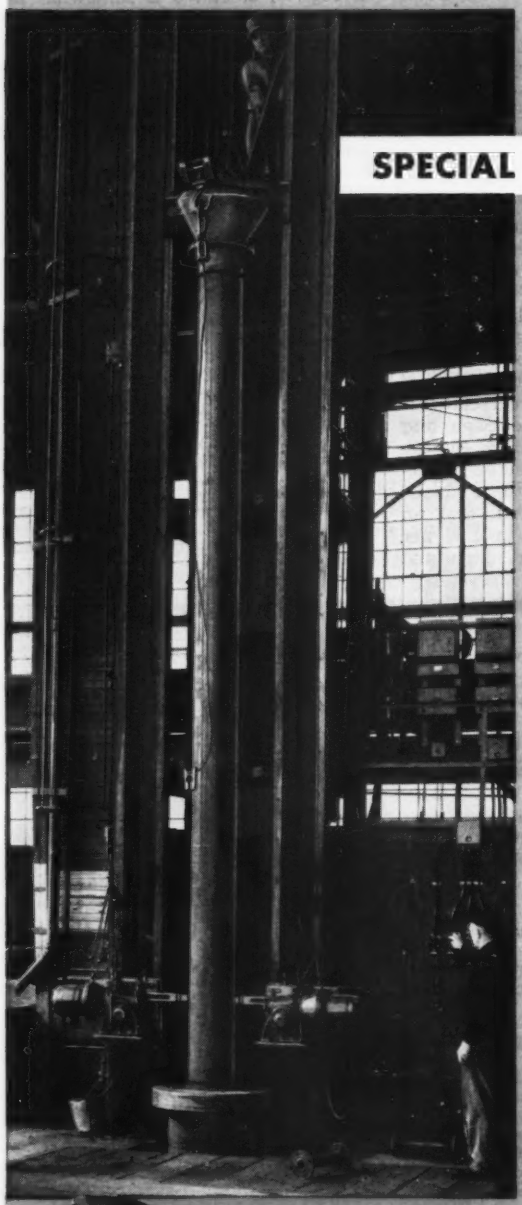

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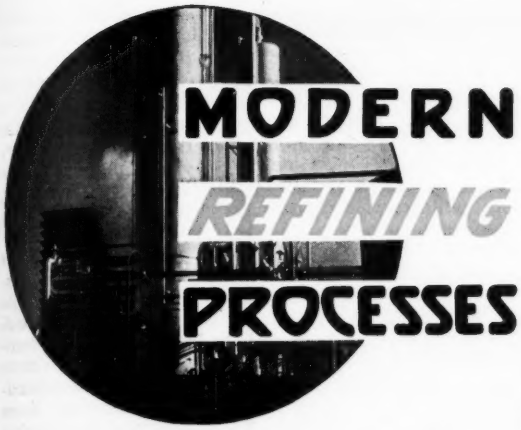


Factors Affecting Yields in Thermal Cracking of Residue Oils to Liquid Residues

by George Armistead, Jr.

PART 17 OF A SERIES

Viscosity breaking is indispensable in thermal-cracking operations; it is applied to reduce viscosity of heavy stocks and lower boiling range and pour points. As percentage conversion to gasoline increases, the viscosity of the residue decreases. It is often more desirable to reduce heavy tars to viscosities well below that required for fuel oil and then "cut back" with light gas oil than to make specification heavy fuel direct. Over-all yield of gasoline is affected primarily by six factors, the four most important of which are gravity of feed, fuel-oil gravity, cracked gas oil drawn from the operation, and gasoline end point produced.

VARIOUS process types are employed for the thermal cracking of residual feed stocks to liquid residues. The most prevalent general operation is that in which feed stocks such as topped crude are cracked to ultimate yields of gasoline, gas, and residue, sometimes with the withdrawal of an intermediate gas-oil stream also, as a product. In other cases, on the very heavy crudes and like stocks the production of gasoline is secondary to the conditioning of residuum for use as fuel and the production of gas oil therefrom.

Representative process types employed in this field were discussed in a preceding article[1], in which it was pointed out that two principal elements are common to all residuum-cracking operations, namely (1) the heating of the residuum, possibly to the extent of cracking for the lowering of viscosity, and vaporization of its gas oil content, and (2) the disposition of the gas-oil content, either through cracking in a separate step, withdrawal as product, or blending with residuum. In some processes, these elements are not individually distinguishable, but they nevertheless exist.

It is the intention here to discuss the several important factors in this phase of thermal cracking which affect yield of products and to present some typical data indicative of the quantitative effect of certain of such factors.

Viscosity Breaking

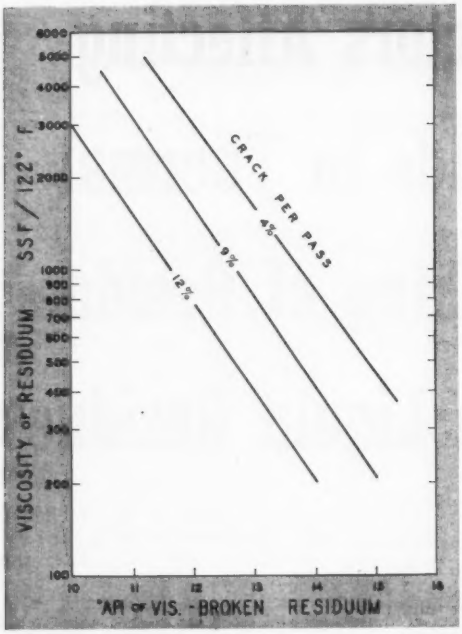
In the securing of maximum yields of cracked gasoline from heavy oils such as virgin residues from crude topping, when running to a specified residue viscosity limitation, viscosity breaking is an indispensable part of thermal-cracking operations. Because of the increased investment for the incremental gasoline and other effects resulting from viscosity breaking, some cracking operations do not include this phase of processing, although its wide acceptance has testified to its ease of economic justification.

Viscosity breaking may be said also to apply to stocks of a distillate character which are lightly cracked for the purpose of lowering boiling range and pour point, which latter effect results from the breaking down of certain heavier constituents as well as the resultant more cyclic character of the gas oil. Such processes as delayed coking and the ultimate-yield type of coking operation have phases corresponding to viscosity breaking on gas oils through the recycling of heavy gas oil to the active coking zones, the result being the formation of gas oils of lower boiling range for subsequent cracking, along with a small amount of incidental cracked gasoline.

The reactions involved in direct residuum cracking are many and varied, particularly when the operation includes gas-oil recycling, and precise criteria to express the extent of the effect included in the term "viscosity breaking" have been very difficult to establish. In general, the greater the extent of cracking of such residual stock, the greater is the tendency toward viscosity reduction of the residues therefrom, and the greater the production of gas oil of a given boiling range.[2,4] Fig. 17-1 is illustrative of this general effect with regard to viscosity, when cracking a 17° A.P.I. paraffinic topped crude residue at different degrees of single pass conversion to 400°-end-point gasoline with 100 per cent C_4 recovery.

This figure shows that in the residue from the cracking at 4 per cent conversion, 12° A.P.I. tar has a viscosity of about 3,000 S.S.F./122°, whereas the same gravity (12°) residue from the 9 per cent conversion operation had a viscosity of only about 1,700 S.S.F./122° and that from 12 per cent conversion about 800 800 S.S.F./122°, while more severe operations, although generally difficult to maintain commercially, would show even further effects in this direction. The curves in Fig. 17-1 illustrate the viscosity-gravity relationship over a considerable range of gravities for these residues cracked at different conversions and is indicative of the reduced °A.P.I. residue possible at a given viscosity with increased severity of viscosity breaking.

Fig. 17-2 is illustrative of the effects of viscosity breaking in the production of gas oil, as well as the effect on viscosity of residue. This covers the single-pass conversion of the same stock as in Fig. 17-1. The upper curve shows 400°-650° boiling range gas oil content of the products from viscosity breaking, which increase from a value approaching zero on the fresh feed (zero conversion) approximately by straight line function up to about 20 per cent at 16 per cent crack per pass. At the same time, the viscosity of the 12° tar (in this case taken as a standard reference gravity) in the total cracked products, which is upward of 4,000 S.S.F./122° on the virgin feed, decreases rapidly as conversion is increased down to approximately 800 at



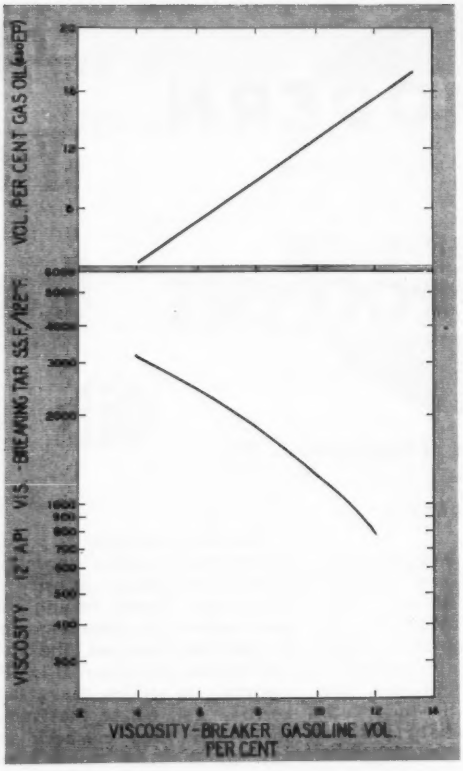


Fig. 17-1—(Above) Typical gravity-viscosity relationships in viscosity breaking virgin 17° A.P.I. topped crude at different crack per pass. Fig. 17-2—(Right) Typical viscosity-breaking effects on 17° virgin topped crude. (Single-pass cracking)

12 per cent conversion, which approaches the limit of commercial operation.

It should be recognized that the 12° tar mentioned is not the actual total residue after the removal of the gas-oil content and cracked gasoline shown in the figure, although it is a progressively decreasing percentage of fresh feed, as conversion increases. With increasing crack per pass, however, the residuum after gasoline and 650 end point gas-oil distillation is a decreasing percentage of fresh feed with lower A.P.I. gravity, and the viscosity also decreases. The viscosity-breaking effects shown in the two figures mentioned apply in different degree to crude residues of different characteristics such as paraffinicity.

Since most refineries operate under the limitation of a maximum permissible fuel-oil viscosity such as 150-200 S.S.F./122° on the total residues produced, operations are so designed as to produce the lowest viscosity fuel oil with minimum sacrifice in gasoline yield occasioned by the required dilution of heavy tars with lighter cracking-stock fractions.

In the cracking of virgin residues, the total residual tar or fuel oil is composed of the more or less nonvolatile heavy cracked residue from the virgin tars and the highly polymerized tars from cracking gas oil along with diluent hydrocarbons of a gas oil character. The tar product from gas oil-cracking is of relatively low gravity and high fluidity compared to that from the cracking of the virgin residue and tends to reduce the viscosity limitation somewhat, but the attainment of the final specification viscosity is generally regulated by the amount and character of the diluent materials.

The following tabulation of the properties of typical flashed tars from the separate viscosity breaking and gas-oil cracking steps in the self-contained cracking to completion of East Texas topped crude is illustrative of the characteristics of these two materials at two different degrees of stripping of diluent gas oil.

	Fuel-oil properties			
	1		2	
Tar from—	Visc. br.	G.O. crkg.	Visc. br.	G.O. crkg.
°A.P.I.	11.6	7.5	9.5	11.7
Visc. S.S.F./122° F.	228	193	380	22
Pour °F.	50	50	60	0

It is generally advantageous from the standpoint of minimizing fuel-oil production of a given viscosity, to strip the cracked tars, especially that from the viscosity breaking, beyond the final specification viscosity and blend back with a light gas oil of the lowest obtainable viscosity.[6] Thus, the heavier diluent materials are replaced by material of a lower viscosity which, when derived from the more highly refractory recycle gas oils, means the minimum sacrifice in obtainable cracking yield, while at the same time less of such low-viscosity stocks is required for cutting residue to final specification viscosity.

The advantage of such procedure is less on gas-oil tar than on the more virgin material from viscosity breaking, since the highly refractory high-boiling gas oils flashed from a gas-oil tar have a low potential cracked-gasoline yield compared to the more viscous corresponding fractions from a viscosity-breaker tar, although even in the latter case the value of such incremental gas oil for cracking may approach the marginal. The difference in effectiveness of different cutting stocks on a viscosity-breaker residue, when blending to 150 S. S. F./122° final fuel oil is illustrated in the following figures.

Viscosity S.S.F./122° F. of tar as produced	Required % of cutter stock in blend — Cutting with — Viscosity breaker gas oil	Recycle cracked gas oil
150	0	0
300	9	6
500	15	12
1,000	19	14
10,000	28	24
50,000	36	27

The fuel-oil-yield difference resulting from stripping of residues and blending back as compared to producing specification tar direct is even greater than indicated by the above since the last increments of gas oil removed in flashing viscosity-breaker tar are considerably more viscous that the average viscosity-breaker gas oil used in the foregoing. It may reach a magnitude of several per cent difference, on the basis of the residual feed. The following example is illustrative of the indicated effect on a 22° A.P.I. Mid-Continent topped crude, cracked to ultimate gasoline yield with recycling viscosity breaking and separate gas-oil cracking, when producing specification tar direct, as against producing a heavier

	Volume % yield	
	Producing specification fuel oil direct	Producing heavy fuel oil and blending with recycle gas oil to specifications
400 e.p. gasoline	51	42
Fuel oil (175 S.S.F./122°)	48	58
Gas (wt. %)	8	6

viscosity-breaker residuum and blending back the total of gas oil tar and viscosity-breaker tar with viscosity-breaker gas oil.

This example, while evidently somewhat imperfect from the standpoint of the inordinately high liquid-volume recovery and a somewhat magnified difference between the two methods, is nevertheless indicative of the trend.

Over-all Yield

The over-all yield of 100 per cent butane recovery gasoline and fuel oil of a given gravity obtainable from residuum cracking operations to ultimate yields is dependent principally on the following factors:

1. Gravity of feed.
2. Gravity of fuel-oil production.
3. Amount of cracked gas oil withdrawn from the operation, if any.
4. End point of gasoline produced.
5. Process characteristics and operating conditions.
6. Feed characteristics other than gravity, such as paraffinicity.

In a general way, the first four of the above are the most important and their effects can be defined more readily than the last two. As a matter of fact, the effects of process characteristics and operating conditions involve so many detail factors that for exactness they must be evaluated specifically for any given cracking process.

As a generalization, it is well known that the processes involving very high-temperature gas-oil cracking (1,050°+) give substantially lower gasoline yields (although of higher octane number) than those operating in a more customary range of (900°-1,050°) and that the same relationship applies to high crack per pass vs. low crack per pass, and that appreciably higher gasoline yields for a given tar gravity are obtainable on the viscosity-breaking operations. Furthermore, selectivity tends to increase gasoline yields, as for example a two-coil stage cracking (recycling viscosity breaking followed by recycling gas-oil cracking) will show increased gasoline for a given gravtiy of total cracked tar compared to a single-coil operation. In addition, appreciable differences in yield appear to prevail between coil-only and coil-and-drum processes, but these are relatively small and more or less dependent on the specific conditions considered.

The effect of various feed characteristics on yields are usually not great and are frequently inconsistent. Mithoff et al[2] have pointed out that for California feed stocks and a particular type of residuum, cracking yields of cracked gasoline can be correlated significantly on the basis of viscosity of feed and of residue. In the main, however, gasoline and cracked-residuum yields are determined by the first four factors above named. Nelson[5] has published a simplified formula relating these variables. On the basis of a standard end point and Reid vapor pressure, and no gas-oil withdrawal, it is possible to correlate with significant accuracy the °A.P.I. of feed and tar with the obtainable gasoline yield, which thus embraces both the principal phases of the operation mentioned in the introductory paragraph.

Fig. 17-3 illustrates such approximate over-all yield relationships for the cracking of topped crudes of various gravities to completion to various gravity tars, and is generally based on the employment of multi-stage viscosity breaking and gas-oil cracking with maximum temperatures of about 980° F. with no gas oil withdrawal. Gas yields can be approximated by weight balance, on the basis of 60° A.P.I. for the 400° e.p., 10-lb.

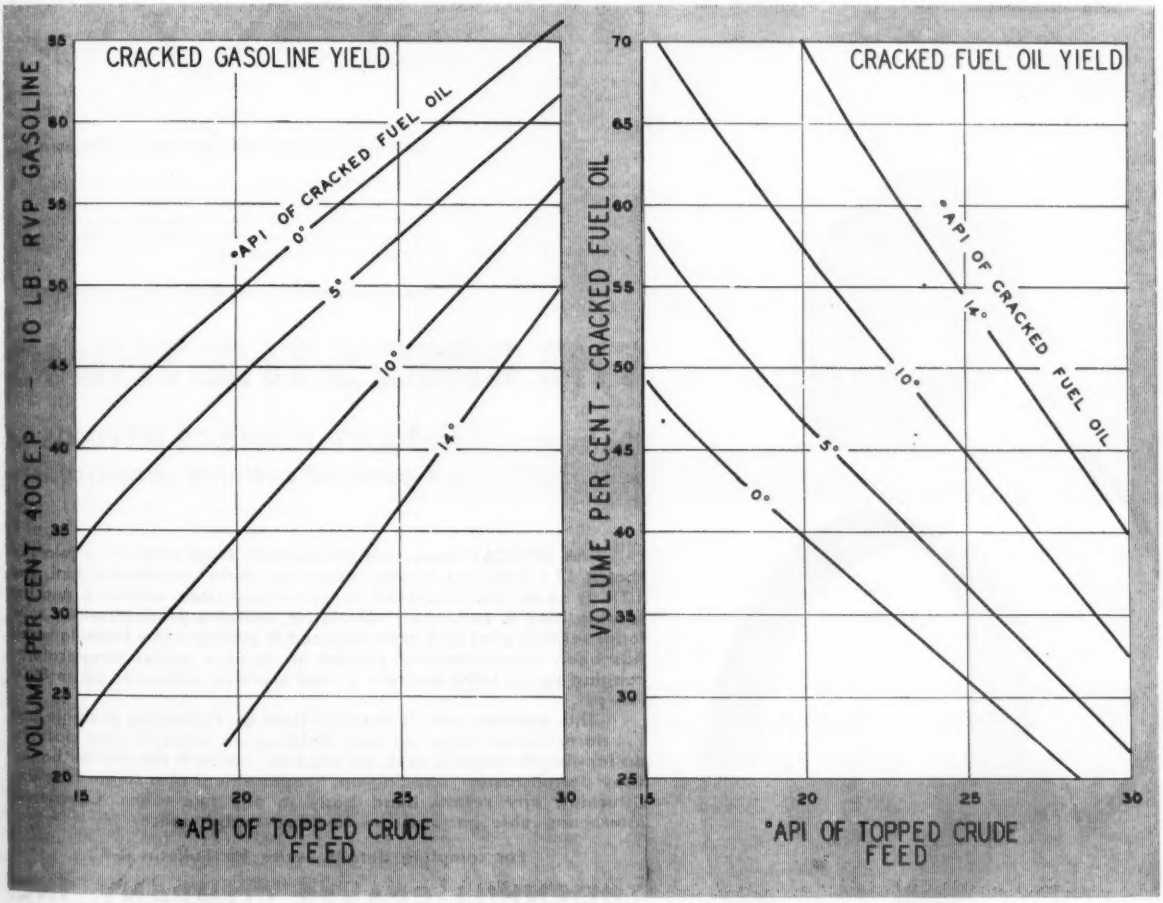
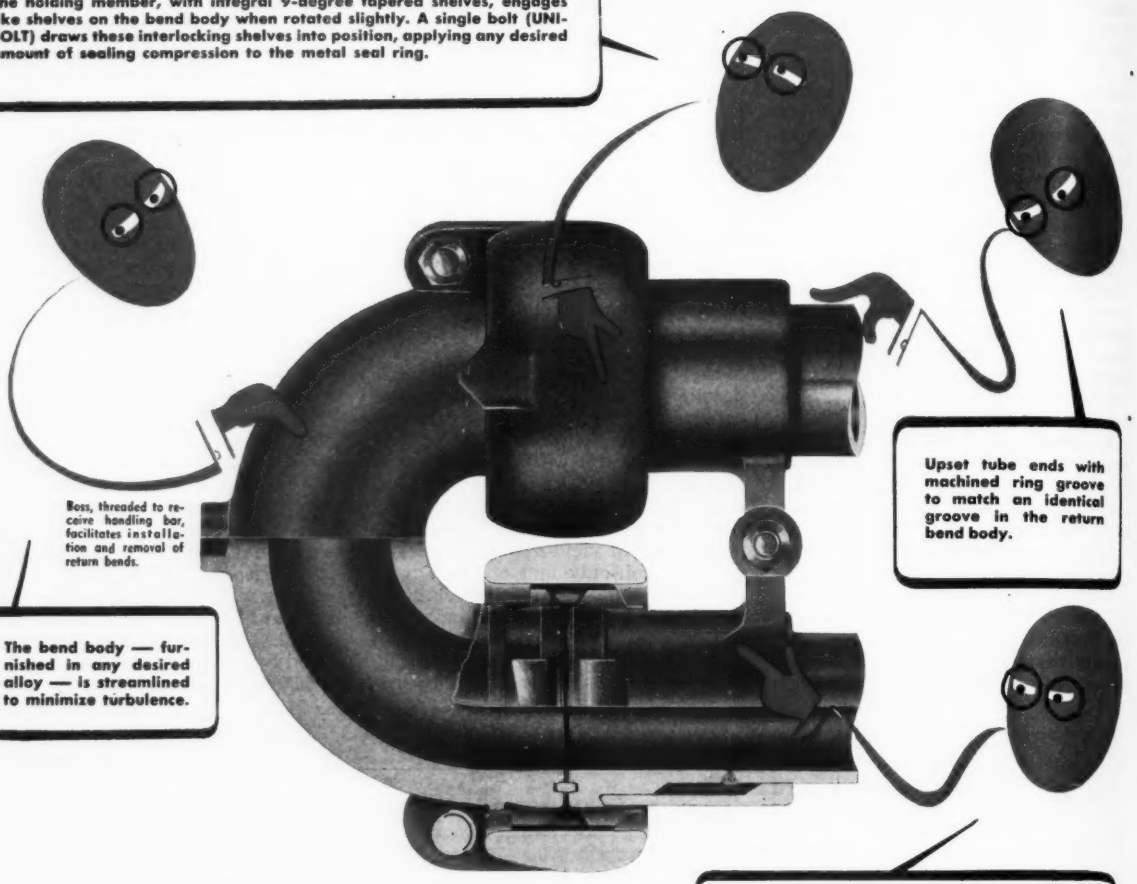


Fig. 17-3—Approximate yield relationships in thermal cracking of virgin topped crude

The holding member, with integral 9-degree tapered shelves, engages like shelves on the bend body when rotated slightly. A single bolt (UNIBOLT) draws these interlocking shelves into position, applying any desired amount of sealing compression to the metal seal ring.



Boss, threaded to receive handling bar, facilitates installation and removal of return bends.

The bend body — furnished in any desired alloy — is streamlined to minimize turbulence.

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cracked gasoline for Mid-Continent feed stocks, which gravity, however, will run lower on the more naphthenic feeds (down to 55°) and slightly higher on the more paraffinic. Fig. 17-3 is subject to an average accuracy of about ±3.0 per cent for gasoline and fuel although in certain cases greater deviations occur.

Effect of Gas-Oil Withdrawal

The withdrawal of gas oil from a topped-crude-cracking operation reduces the yield of both gasoline and fuel oil by approximately the amount derivable by the ultimate cracking of such withdrawn fractions. Naturally, this depends upon the character of the withdrawn fraction which in turn is dependent upon the nature of the feed stock, type of cracking operation, and other factors. Precise estimation of this effect is a very specific matter, but the decreases in yield can be approximated by the use of the following yields of 400° e.p. cracked gasoline obtainable from such withdrawn gas oils, based on 10° tar production.

Properties of withdrawn gas oil	Potential volume % gasoline yield		
°A.P.I.	18	24	30
A.S.T.M. 50% point 500°	..	32	53
A.S.T.M. 50% point 550°	..	36	56
A.S.T.M. 50% point 600°	21	41	..
A.S.T.M. 50% point 650°	23	45	..

The potential cracked residuum production from such withdrawn gas oil can be estimated by weight balance on the basis of the foregoing gasoline yields and a range of gas production of the order of 18-33 per cent by weight of the potential cracked gasoline production between the respective U.O.P. characterization factor extremes of about 11.5 to 10.8 on the gas oil in question.

The effect of cracked-gasoline endpoint change on yields of gasoline and fuel oil appears to follow generally linear relationships. The effect on gasoline yield is of the order of 3 per cent (volume) change on basis of gasoline yield for each 10° change above or below 400° e.p., this relationship extending over a range of at least 20° each way from that point and the yield decreasing, of course, for the lower end point. At the same time, 10° difference in end point affects fuel oil about 1 per cent on basis of fuel-oil production. Gas yield (weight per cent) changes about 0.4 per cent for each 10° change in end point, decreasing at the higher end points because of the resultant lesser amount of cracking done and increasing at the lower end points for the opposite reason. These relationships are based on the cracking of residues of 20°-25° A.P.I. and may vary somewhat with individual feed stocks, but are of this general order.

The foregoing resume of factors affecting yields obtainable in the cracking of residual stocks is directed at defining the relative magnitude of the various factors involved and like all generalizations is not necessarily applicable to any specific situation. In general, the data given in the foregoing are intended mainly to be illustrative of the effects described, although the Fig. 17-3, covering a correlation of yields obtainable from reduced crudes, is felt to be significant and of a higher order of accuracy than is possible in amplified formulas which have been suggested in the past.

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QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

Kinds of Lubricating Oils

I am just starting into lubricating-oil manufacture and I should like to know of a good book on the subject. There are so many kinds of oils that they confuse me. Can you outline the kinds of lubricating oils?—R. M. G.

There are fewer oils than there are names for them. This has occurred naturally because of the fact that users of oils tend to name them after the particular service that they perform, and the refiner tends to accept the name provided by the user in order to keep track of the services. In actuality, less than a dozen general types of oils would take care of nearly all services, although each of these types would need to be provided in several grades of viscosity. During World War II the Army, Navy, and Air Corps got along well on 17 main oils, among which were 2 aircraft oils, 3 engine oils, 3 gear lubricants, 2 recoil oils, 2 preservative oils, and 1 each of hydraulic oil, brake fluid, shock absorber, machine gun (and aircraft instrument) and car and locomotive oils. Only about 12 of these oils are required at any one time or for a particular climate.

The Bureau of Ships Bulletin 431, entitled "Lubricating Oils," indicates much the same. About 24 major oils are recommended for over 150 services. Even the 24 oils cover only 9 main types (3 of which are engine oils that differ from each other only in viscosity index). This bulletin shows 150 or more applications in the form of an index. Their Series 3000 oils, classed as forced-feed oils (medium v.i.) are mentioned in the index as being suitable for 87 services ranging from ring-oiled turbine bearings to air-conditioning machinery, and hence, each type of oil has a wide variety of uses. The Bureau of Ships classification system was discussed in Questions on Technology, The Oil and Gas Journal, page 53, January 20, 1944.

Table 1 on this page is an attempt to indicate the properties of the major groups of oils. An effort was made in Questions on Technology of March 23, 1944, page 124, to organize a numbering system similar to that of the Bureau of Ships but broadened to cover more service requirements than those of the U. S. Navy. In general, the major differences in service requirements may be grouped as indicated hereafter.

1. Automotive engines. — Spark-ignition engines for automobiles, motorcycles, trucks, power engines, aircraft, and general machinery. A high-viscosity index and a good resistance to heating or oxidation are important.

2. Engine oils.—All types of machinery including automobiles in warm climates and some low-duty diesel engines. A medium viscosity index and resistance to sludging or oxidation.

3. Diesel engines.—Diesel engines or general machinery not subject to large changes in temperature and certain uniformly low or high-temperature services. Low viscosity index oils or heavy-duty oils containing additives which clean the diesel engine or keep the debris in suspension.

4. Cold-test oils.—For any low-temperature service such as refrigeration, arctic climates, machine guns, hydraulic oils, instruments, etc. Pour point is a main consideration although the viscosity at the operating temperature and other special properties may be of importance.

5. Compounded oils.—Steam cylinders, air compressors, marine engines, etc., require an oil that will emulsify with water and hence, not wash off the walls of the cylinder. Tallow, lard, rapeseed oil, etc., are used in amounts ranging from 5 to 20 per cent. Important tests are neutralization number and per cent fixed fatty oils.

6. Color oils.—Such services as food, paper, or textile manufacture require light or a white color, and, of course, a white oil is required for medicinal purposes. A.S.T.M. color is important.

7. Turbine oils. — High-speed machinery such as steam turbines and dynamos tend to emulsify the oil and hence, oils that demulsify quickly are necessary. The A.S.T.M. steam emulsion number (D157-36) or demulsibility test (320.13) of the Federal Standard Stock Catalog are important.

8. Transformer oils. — These and other insulating oils must not leak electricity at high voltages and hence, a dielectric strength test is vital. Steam emulsion number is sometimes important.

9. Corrosive oils.—Oils for cutting tools, hypoid gears and other extreme-pressure lubricants must contain chemical additives which cause corrosion at some range of temperature. Suitable corrosion tests and special performance tests are necessary.

TABLE 1—RANGE OF PHYSICAL PROPERTIES OF LUBRICATING OILS

Name of oil—	A.P.I.	Viscosity at 100° F.	Viscosity at 130° F.	Viscosity at 210° F.	Vis. index	Flash (O.C.)	Pour point	Carbon residue	Compounding oil (%)	Special property
Motor, light	24-30	....	90-185	40- 55	70-100	360-400	—10 to 15	0.03-0.5	....	.....
Motor, medium	22-28	400-650	185-293	62- 90	50-100	400-450	0 to 25	0.1-0.9	....	.....
Motor, heavy	20-27	.....	.....	80-155	40-100	440-510	0 to 25	0.2-1.8	....	.....
Aircraft engine, light	24-26	.....	.....	60- 85	90-100	400-425	—10 to 0	0.8-1.0	....	Settle from salt solution, 60 min.
Aircraft engine, heavy	23-25	.....	.....	100-145	90-100	475-500	0 to 30	1.5-2.0	....	Settle from salt solution, 60 min.
Diesel engine, lightest	23-25	.....	120-185	.....	40- 70	330-350	—10 to 10	0.2-0.5	....	.....
Diesel engine, heaviest	22-25	.....	.....	75- 90	40- 70	390-410	0 to 20	0.3-0.8	....	.....
Transmission oil, lightest	21-23	800-1500	.....	.....	....	300-420	—10 to 10	.....	....	Precipitation No., 0.1 max.
Transmission oil, heaviest	20-22	.....	.....	200	....	500+	0 to 30	.....	....	Precipitation No., 0.1 max.
Engine & Machine, spindle	25-27	100-125	.....	.....	....	320-350	0 to 30	.....	....	.....
Engine & Machine, heaviest	21-26	700-800	.....	.....	....	375-400	0 to 30	.....	....	.....
Cold test, light	27-32	140-170	.....	.....	....	310-350	—20 max.	.....	....	.....
Cold test, heavy	25-28	300-325	.....	.....	....	340-400	—10 max.	.....	....	.....
Cylinder oils, unfiltered:										
Light mineral	25-28	.....	.....	135-165	....	490-540	20 to 60	2.0-3.0	nil	Neutralization No., 0.15 max.
Heavy mineral	20-26	.....	.....	175-220	....	520-600	30 to 60	3.0-4.0	nil	Neutralization No., 0.15 max.
Light compounded	25-28	.....	.....	95-110	....	450-510	10 to 40	1.0-2.0	9-10	Neutralization No., 1.0 max.
Heavy compounded	20-26	.....	.....	175-220	....	520-600	30 to 60	3.0-4.0	5-7	Neutralization No., 1.0 max.
Marine engine, mineral	23-28	.....	.....	65- 75	....	350-410	35 max.	.....	nil	Neutralization No., 0.1 max.
Marine engine, compounded	23-28	.....	.....	65- 80	....	350-410	35 max.	.....	15-20	Neutralization No., 3.0 max.
Turbine oil, light	29-31	120-175	.....	.....	....	310-360	0 to 35	0.02-0.1	....	Steam emulsion number, demulsibility, and sligh oxidation number also specified
Turbine oil, medium	27-30	175-340	.....	.....	....	320-410	0 to 35	0.05-0.3	....	
Turbine oil, heaviest	26-28	475-525	.....	.....	....	350-450	35 max.	0.1-0.4	....	
Transformer oil	28-30	55- 65	.....	.....	....	275-325	—50 to 30	.....	....	Dielectric strength, 1-in. disk, 0.1-in. gap, 25,000 volts
Black oil, summer	20-25	400-500	.....	.....	....	.....	0 to 30	.....	....	Insoluble per cent, 0.1
Black oil, winter	20-27	200-300	.....	.....	....	.....	—20 to 0	.....	....	Insoluble per cent, 0.1
White oil	29-32	55-140	.....	...	....	260-380	.....	.....	....	Colorless

Fishing and Cutting Technique

(Continued from page 81)

chance and rely on the ultimate strength of the steel to maintain connections between the surface and the cutter.

After spotting the tool at 16,966 ft., a depth just above the drill collars, the first inside cut was attempted. This cutter is composed of three tool-steel knives set in the body of the tool, and expanded by means of slidable wedge arms. As illustrated, the tool is first brought into operation by rotation. Friction blocks resist this rotation and permit the unscrewing of the sleeve containing the slips and the friction blocks. As soon as this sleeve has unscrewed from the body, the slips expand on an inner tapered mandrel and bite into the walls of the fish. Further lowering the operating string then is resisted by the slips, which in turn force the wedge arms under the knives. This is a gradual, slow operation and continued rotation soon causes the knives to sever the pipe. The tool is immediately released by an upward motion of the operating string.

Shortly after the initial inside cut attempt had been started, the excessive weight of the string caused the pipe to twist off very near the surface. The small operating string was subsequently fished out of the stuck pipe by means of a special, very thin spring dog-type overshot. The second attempt at inside cutting was also a failure. After spotting the cutting tool at 16,934 ft. and proceeding with cutting operations for a satisfactory length of time after receiving indications that the cut had been complete, withdrawal of the tool was begun. However, before many stands had been removed from the hole, the becket in the lift failed and dropped the string of small drill pipe again. These two failures caused severe shock to the tool joints of the pipe, and this small operating string again failed during its removal by fishing.

After considerable time was spent in fishing this small operating drill pipe from within the 3½-in. stuck fish, it was decided that the third inside cutting attempt would be made with another tool and that 10,000 ft. of 1¼-in. upset tubing would be run on the bottom of the small drill pipe. This latter section of pipe would lighten the load placed on the upper joints of the 1.66 o.d. operating string. After setting the tool at 16,410 ft., the cut was completed and that amount of 3½-in. drill pipe was removed from the hole.

During all inside-cutting operations, the power of rotation was supplied by a new tool—the power swivel. This is a swivel driven by a small hydraulic motor with adequate hydraulic controls that permit rotation in either direction. The hydraulic power for the motor is developed by a small hydraulic pump which in turn is driven by a high-speed multicylinder gasoline engine. The engine and pump remain on the ground away from any combustible fluids that might be present at the well head. The controls are on the rig floor and are easily accessible to the operator. The swivel normally rotates at 17 r.p.m. and develops approximately 1,000 ft.-lb. of torque.

In drilling to this great depth, as in any other drilling operations, twistoff hazards are always prevalent. This photograph shows the results of dropping an earlier string of drill pipe in this well

Second Operational Phase

After the removal of the fish resulting from the first successful inside cut, the second phase of operations consisted principally of washing over and severing the remaining fish in sections with the outside cutting tool. Due to the 7-in. casing and the 4½-in. tool joints on the drill pipe, it was necessary to build a special outside cutter that would pass inside a 5¾-in. bore and over the 4½-in. diameter of the tool joints. This meant a tool that would have a 5⅝-in. outside diameter and a 4⅝-in. inside diameter—thus permitting ⅛-in. clearance on either diameter. Such a tool provided ½ in. of cross-sectional area for the operating mechanisms.

The outside cutter is composed of a shell with three knives set in slots therein. These knives are forced inward to contact with the fish by means of a slidable wedge bowl. In the design of one tool the force behind this wedge is provided by a preloaded spring. Pins prevent the spring from acting until they have been sheared by pulling the incorporated overshot under the uppermost tool joint in the joint of pipe to be cut. The other type of cutter is provided with a packoff that would utilize the hydraulic force of the mud pumps to expand the knives. This cutter is also provided with slips in the overshot to cut with an upward strain (by binding the slips under the topmost tool joint) should this be desirable.

The washing-over operations were accomplished by torch-cut and hard-faced teeth on the bottom of a joint of 5½-in wash pipe. Approximately 315 ft. of wash pipe was used originally below the 3½-in. drill pipe. After this operation, and also after conditioning the hole satisfactorily, the inside cutter was run in place of the washover shoe and spotted at a depth of 16,667 ft. The first cut was completed here with the third tool. After recovering the amount of fish freed by this operation and removing it from the hole, washing-over operations for the second section of drill pipe were begun. The first cutter was run this time and successfully made a cut at 16,839 ft., and 172 ft. of 3½-in. drill pipe were removed as the result of this operation. The third cut was made at a depth of 16,960 ft. with the third cutter in the joint of drill pipe just above the drill collars. After the recovery of this 121-ft. section of drill pipe, the evidence of the second inside cut was found. While laying the bottom joint down it came apart at the groove made by the inside cutter.

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That's one of the outstanding advantages of alloy steels. Because of their strength-to-weight ratio they may be used in thinner sections to save burdensome weight—*without any sacrifice of needed strength.*

Other advantages of alloy steels are important to petroleum equipment designers and engineers, too. They are excellent in their uniform response to hardening treatment—resist wear. They are tough—withstand severe shock and strain. They resist fatigue—insure safety. And, in stainless grades, they resist corrosion as well as oxidation at high temperatures.

For the lowest cost per year of service life on tough assignments, specify Republic Alloy Steels—made by the world's largest producer of these fine steels.

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GENERAL OFFICES • **CLEVELAND 1, OHIO**
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ALLOY STEELS

Other Republic Products include Casing—Tubing—Line Pipe—Upson Studs, Bolts, Nuts and Rivets—Electrunite Boiler Tubes

MODERN Rotary DRILLING

Draw-Works Clutch System

APPLICATION of internal-combustion engines as a source of power for the rotary rig brought about the problem of necessary changes in the clutch system of the draw works. Jaw clutches, which were a standard equipment on the steam-rig draw works, were not satisfactory. Because of characteristics of internal-combustion engines, use of jaw clutches resulted in slowing down of operations and in imposing of severe shocks on the whole drive system. Solution of the problem was in application of friction clutches, which made possible smooth, quick, and positive engagement. Of the methods of clutch control used, pneumatic control became most generally accepted.

Depending on design, different types and different number of clutches are used at different points of the system. In general, the main clutch requirements of a power-rig draw works may be summarized as follows: (1) master clutch, located between the source of power and the transmission and furnishing the over-all control of the draw works; (2) speed-selection transmission clutches; (3) shaft clutches of the draw works proper, including the drum-shaft low and high-speed clutches; (4) rotary drive clutches, and (5) auxiliary brake clutches. Additional clutches for operating sand reel, automatic cathead, etc., may also be needed.

Air-Operated Clutches

Several types of air-operated clutches are used. Regardless of the type employed, introduction of pneumatic control necessitated solution of certain special problems if safe and efficient operation of the system was to be attained.

Types. — An air-operated disk clutch substitutes air pressure for the action of the conventional lever-and-toggle joint mechanism. The pressure plate acts as an annular piston, pressed and held against the lining by compressed air. When the air is released, special springs return the plate to the disengaged position. Several variations of this basic principle are available. Considerable progress has been made in the development of the clutch facings, which maintain nearly constant coefficient of friction over a wide range of temperatures.

The constricting type of air-operated clutch, now widely used, consists of a flexible, tire-like pneumatic element, which is expanded by air pressure. Removable friction blocks are fastened to the one side of the element. The other side is bonded to the clutch rim which in turn is attached to the shaft. When the element is expanded by the air pressure, the friction blocks are contracted against a steel flange bolted to the sprocket hub cap. (Fig. 23-A). When the element is deflated the clutch disengages. (Fig. 23-B).

Other types of draw-works clutches are also air operated.

Operation. — Remote control of the air-operated clutches is from the driller's position. Small levers operate special air valves which admit compressed air to clutches to be actuated.

The air lines leading to all the clutches, including those of the engines, are unitized into manifolds. In moving the rig it is necessary only to disconnect these manifolds. Arrangement is such that it is not possible to reconnect these manifolds in any but the right way.

Safe operation of air-actuated clutches involves two problems. One is an assurance that no two clutches can be accidentally engaged at the same time. All pneumatic clutch systems have devices serving this purpose. Another is the question of an emergency arrangement, in case of failure of the high-pressure air supply. This problem is solved in different ways in the different makes of draw works. In one case, for instance, the low-speed, drum-shaft, air-operated, constricting-type clutch may be bolted in an engaged position and the draw-works drive friction-disk clutch may be hand operated.

Air supply.—The air compressors may be driven from the engines in which case the air supply is available soon after the engines have been started. Or they may be driven from the transmission shaft. In such case a hand pump is provided for the initial actuation of the clutch providing the drive to the compressors. Sufficient number of compressors is provided to make one operate as a standby unit.

Volume tank, equipped with gage, pressure-regulating valve, safety valve, and automatic water trap, at the lowest point of the piping, are included in the high-pressure air system.

Other Control Methods

Other methods of control and operation of clutches, besides the pneumatic, are also employed. One manufacturer uses vacuum for powering of the clutches. Vacuum is obtained from the engine if gas-gasoline or butane fueled engines are used. For use on diesel-powered rigs a vacuum pump is furnished. Hydraulically operated systems are also available.

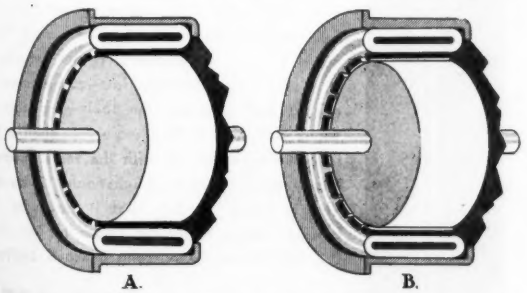

Fig. 23—Operating principle of an air-operated clutch. In "A," the tire-like pneumatic element is expanded, and clutch is engaged. In "B," the element is deflated, clutch is disengaged

CORRECTION

Hydraulic Brake Data. In the "Modern Rotary Drilling" installment No. 17, Journal issue of April 26, page 181, in discussing the principle of operation of the hydraulic-type auxiliary draw works, the capacity was erroneously stated to be directly proportional to the speed of rotation and to the diameter of the rotor. Actually these factors play a much more powerful function, the capacity of a hydraulic brake being proportional to the cube of the speed of rotation and to the fifth power of the diameter of the rotor.

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RIDGID Pipe Cutter

is efficiently-balanced for clean speedy work

4-wheel No. 42 for fast quarter-turn cutting.

● This new style RIDGID is easy on your time and muscle; rolls through pipe extra fast, extra easily, leaving practically no burr. Made to toe the mark by its neatly balanced well designed malleable frame, the heavy-duty tool-steel wheel always cuts true. Every cutter is factory-tested. Choice of 5 sizes to 6" capacity, 4-wheel cutters to 4." You'll like this speedy work-saver—buy it at your Supply House.

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SAVES MANPOWER!

Norris Clutch Type Valve Puller Eliminates Extra Pulling of Rods To Pull Lower Valve . . .

This is no time to *waste* precious manpower. This is an emergency that calls for the *conservation* of labor and the *saving* of time—and in pumping wells such a policy demands the use of the Norris Clutch Type Valve Puller. As part of your pumping string, this performance-proved device does *not* retard production or emulsify the oil. But it *is* ready at a moment's notice to pull the standing valve quickly, safely, positively, thus *saving* the extra run of the rods and the time and labor it involves. Desirable in peace, essential in war, it belongs in all pumping wells.

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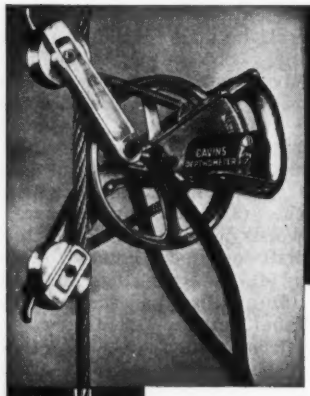

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THE CAVINS DEPTHOMETER

The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

Reciprocating-Pump Calculations—Part 1

TENTATIVE SCHEDULE OF TOPICS

No. 140—Stack Size—Furnace Draft
No. 141—Acid Quantity
No. 142—Performance of Centrifugals
No. 143—Reciprocating Pumps
No. 144—Reciprocating Pump Calculations—Part 1
No. 145—Pumping Costs
No. 146—Steam Consumption—Part 1
No. 147—Reciprocating Calculations—Part 2
No. 148—Steam Consumption—Part 2

STEAM-DRIVEN reciprocating pumps are probably the most widely used variety although centrifugal pumps are making rapid inroads into the field of refinery pumping. In general, reciprocating pumps consist of a pump rod to which is connected a liquid piston and a steam piston. A modified D-slide valve admits steam behind the steam piston, and as the liquid piston moves it discharges liquid ahead of it through check valves and sucks liquid into the cylinder behind it through check valves. High-pressure air or gas can be used to drive the pump but steam is the common source of power.

Double-acting.—Liquid is being sucked into one end of the cylinder while liquid is being discharged from the other side of the piston.

Simplex.—A single liquid cylinder directly connected to its steam cylinder.

Duplex.—Two liquid and two steam cylinders so timed that the four liquid cylinder ends discharge one after another at 90° intervals in a complete revolution.

Outside end-packed plunger.—A type of pump consisting of a cylinder with a solid partition at the center so that plungers enter at both ends of the cylinder. This permits the packing to be easily adjusted and repaired.

Head (h).—The pressure produced by a column of fluid.

$$\text{Psi.} = 0.433 \text{ ft.} \times \text{sp. gr.}$$

$$\text{Ft. head} = \frac{2.31 \text{ psi.}}{\text{spec. gravity}}$$

Volumetric efficiency (E_v).—Actual displacement of liquid from a cylinder as a fraction of the displacement volume. Due to leaks past valves, past piston, or through stuffing boxes; vaporization by liquid during suction; or short stroking. Ranges from 96-98 per cent when handling nonvolatile liquids at low spreads in long-stroke pumps but ordinarily ranges from 89 to 93 per cent.

Hydraulic efficiency (E_h).—Usually negligible except in designing inlet ports, etc. Caused by friction loss in suction line, mixing of liquid, losses through valves and velocity head imparted to fluid.

Mechanical efficiency (E_m).—Fraction of power delivered to steam piston that is applied to the liquid by the liquid-end piston. Inefficiency arises by friction of pistons on cylinder walls and of rod sliding through packing boxes. Ranges as shown in the tabulation on this page.

Piston speed (S).—Total distance in feet forward and backward during 1 minute, also the product of strokes per minute times length of stroke divided by 12.

Discharge pressure.—The liquid pressure is a function of the steam pressure, the areas of the liquid and steam cylinders, the mechanical efficiency and the hydraulic efficiency. The hydraulic efficiency is normally negligible, and hence:

$$\Delta P_L = \frac{D_s^2}{D_L^2} \times \Delta P_s \times \frac{E_m}{100}$$

or the liquid cylinder diameter for fixed steam and discharge pressures:

$$D_L = \sqrt{\frac{D_s^2}{\Delta P_L} \times \Delta P_s \times \frac{E_m}{100}}$$

in which:

D_L = liquid cylinder diameter, in.
D_s = steam cylinder diameter, in.
E_m = mechanical efficiency, per cent (see tabulation)
ΔP_s = steam pressure minus exhaust pressure, psi.
ΔP_L = discharge pressure minus suction pressure, psi.

PISTON SPEEDS AND EFFICIENCIES*

Stroke, in.	Piston speed—feet per minute: Cold water, oil to 250 S.S.U.	Oil, 250 to 500 S.S.U.	Oil, 500 to 1,000 S.S.U.	Oil, 1,000 to 2,500 S.S.U.	Oil, 2,500 to 5,000 S.S.U.	Hot oil above 350° F.	Boiler feed 200° F.	Mechanical efficiency, per cent: Piston type	Ouside plunger to 300 psi.	Pressure: To 1,000 psi.	Pressure: Above 1,000 psi. and thick liquids
3	30	26	23	18	15	18	18	49	47	44	38
4	35	30	27	21	17	21	21	53	52	49	41
5	40	35	31	24	20	24	24	59	56	53	46
6	45	39	35	27	22	27	27	65	61	58	50
7	50	43	39	30	25	30	30	68	64	60	53
8	55	48	43	33	27	33	33	71	67	63	55
10	63	55	49	38	31	38	38	76	72	67	58
12	70	60	54	42	35	42	42	78	74	70	60
15	80	70	62	48	40	48	48	80	76	73	62
18	90	75	70	54	45	54	54	82	78	75	64
24	100	90	82	64	54	64	64	85	81	77	66
36	120	108	96	78	68	78	75	87	83	79	68

*Mainly from Worthington Pump & Machinery Corp.

No. 144 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa

For Exploration Drilling to 1,500 Feet

An outstanding light portable drilling machine with a 10-foot mechanical pull down feed, 4½x6 Gardner-Denver mud pump, two hoisting drums, oil clutches enclosed in chain transfer case. Power supplied from truck motor through heavy duty FRANKS split shaft power take-off. Extremely rugged; ideal for hard drilling to 1,500 feet.

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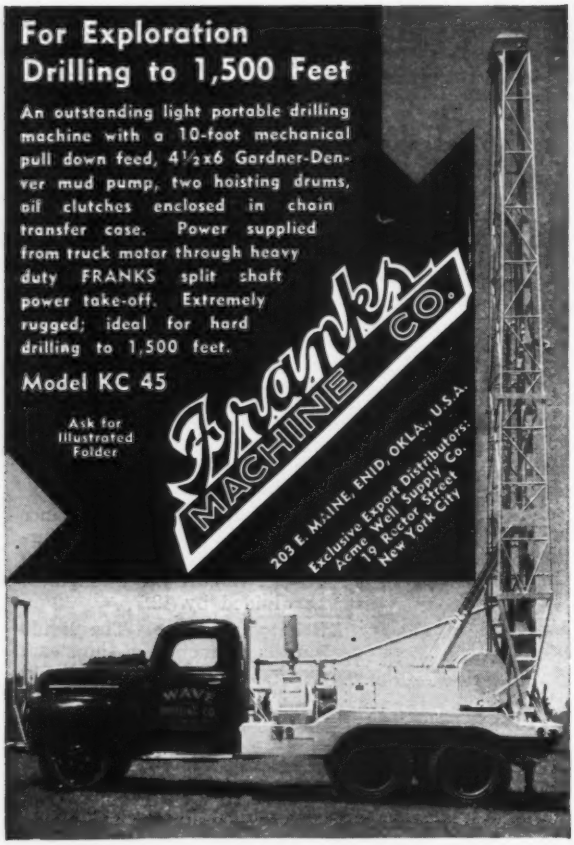

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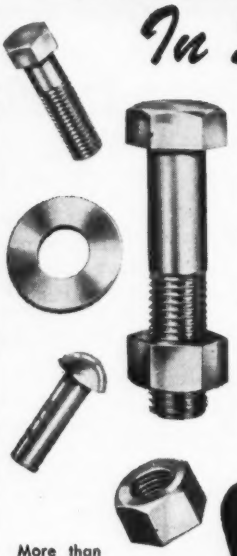

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- **ONLY 2 EASY-TO-REACH OILING POINTS** . . .
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MODELS FROM 1 TO 7½ KW CAPACITY . . . SEND FOR ILLUSTRATED CIRCULARS TODAY

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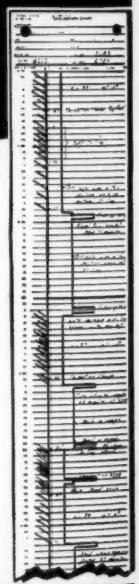

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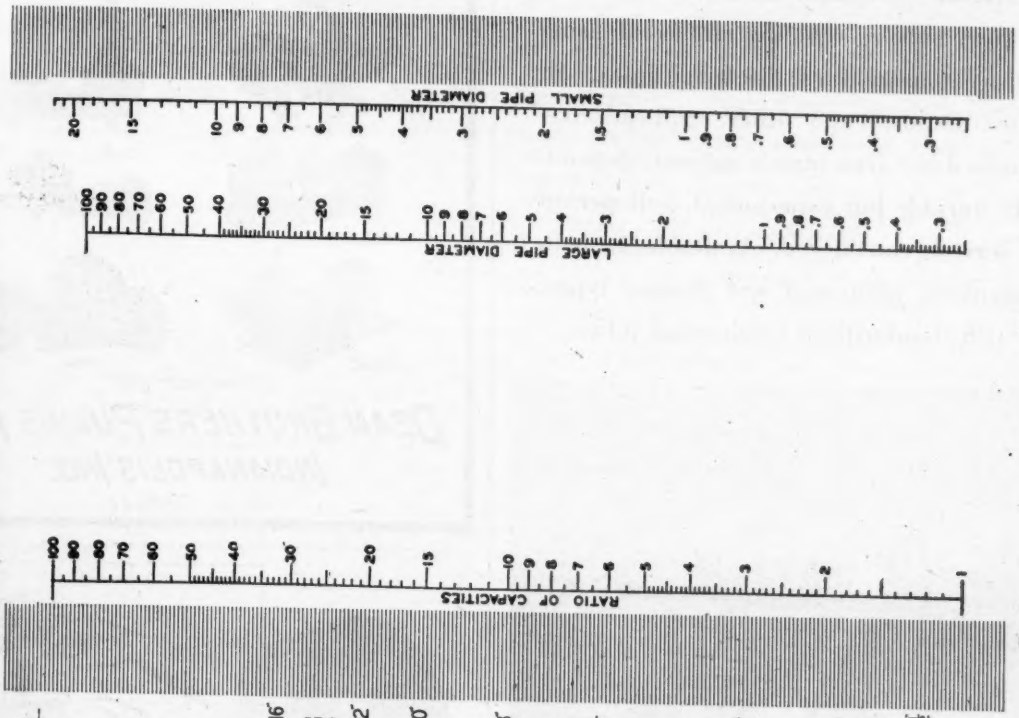
ENGINEERING fundamentals

This is the second of a series of useful graphs, alignment charts, and fluid-flow curves presented through the courtesy of the Southern California Meter Association.

Comparative Pipe-Line Capacities

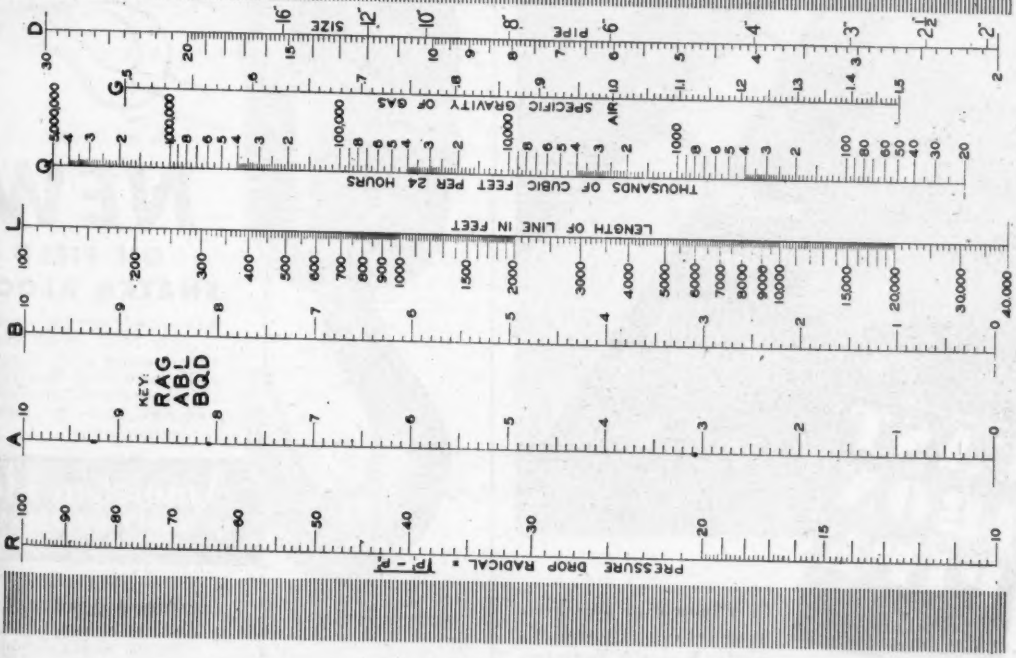


Basis:

$$R = \left(\frac{L}{S}\right)^{2.66}$$

where R = Comparative capacity ratio; L = Diameter of large pipe; S = Diameter of small pipe.

Gas Flow in Pipe Lines



Basis:

$$Q \text{ (at 14.73 psi. \& 60° F. base)} = 49 \sqrt{\frac{(P_1^2 - P_2^2)D^{5.1/3}}{LG}}$$

= M.c.f./24 hrs.

PIPE WITH WHAT IT TAKES TO FIGHT CORROSION

Stubborn resistance to corrosion is inherent in cast iron pipe. To meet super-corrosive conditions, its resistance can be increased by alloys. But for all-around refinery service—cooling and condensing coils, rundown lines, discharge lines, salt water disposal and other applications—standard cast iron pipe is not only dependably durable but economical, full period of service considered. Available in bell-and-spigot, plain end and flanged types, or with standardized mechanical joints.

Cast Iron Pipe Research Association, Thomas F. Wolfe, Research Engineer, 1015 Peoples Gas Bldg., Chicago 3, Illinois

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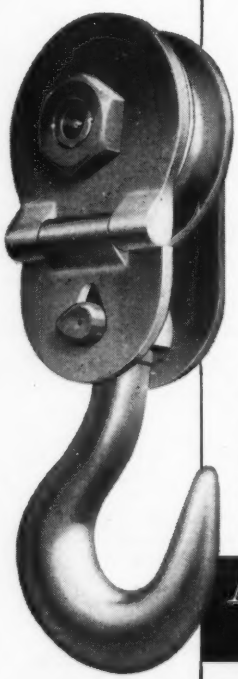

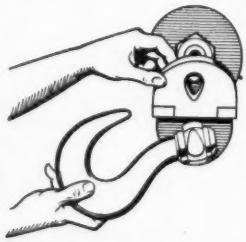

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723

NATURAL GAS

Underground Gas-Storage Project Work to Start

Construction is scheduled to begin this week near Mount Prospect, Ill., on a project which will provide underground storage for 40,000,000 cu. ft. of natural gas.

The project, being undertaken by Public Service Co. of Northern Illinois, is the first of its kind and follows the design of a 1,250,000-cu. ft. pilot installation built by the company last autumn at Kankakee, Ill. (For details of the pilot installation, see page 60, The Oil and Gas Journal, for March 1, 1947.)

Pipe sections for the project, manufactured by National Tube Co., subsidiary of United States Steel Corp., are fashioned from 24-in., seamless molybdenum steel pipe with a wall thickness of ½-in. Each section is 40 ft. long with a capacity of 25,000 cu. ft. at 2,240 psi. They are nosed in at the ends and machined for interconnection.

Company officials said the underground gas-storage project is designed to provide lower costs of initial installation, operating, and maintenance than conventional-type facilities. Aboveground hazards also are expected to be eliminated by the new-type installation.

With storage in small units, capacity may be added easily, and units may be taken out of service for repair or inspection without disturbing others.

Gas-Technology Short Course to Open May 27

The second annual short course in gas technology, sponsored by the Texas College of Arts and Industries, Kingsville, Tex., and the Southern Gas Association, will be conducted at the college May 27-30.

Instructors from the college faculty and from the industry will conduct 12 hours of classroom and laboratory work in technical problems of production and transmission and in gas utilization, in addition to open forums on related subjects.

Enrollment other than local will be limited to 150. The course will include an all-day trip to natural-gas cycling plants in the Rio Grande Valley.

Subjects will include pressure welding, backfills for sacrificial anodes, corrosion in condensate wells, improved methods of pipe-line design, electrolytic model studies, continuous well logging, rice drying, design and application of submergent gas burners, and special applications of natural gas.

Mississippi River Fuel Allocation Plan Approved

WASHINGTON.—The Federal Power Commission has allowed emergency rules and regulations covering deliveries of natural gas by Mississippi River Fuel Corp. during the 1947-48 heating season to become effective April 1, 1947.

The emergency rules and regulations were the result of a conference between representatives of the corporation, its customers, state commissions of Illinois, Missouri, and Arkansas and the Federal Power Commission. The purpose of the conference was to set up an equitable formula for allocation of available capacity and for service curtailments that may be necessary because of inability of the corporation to complete its construction program and make adequate gas supplies available, according to an FPC announcement.

Chicago District Proposes Lease of Two City Lines

WASHINGTON. — Chicago District Pipe Line Co. has submitted to the Federal Power Commission a proposal that it be allowed to lease two pipe lines and auxiliary facilities from Peoples Gas Light & Coke Co.

Chicago District, which sells gas to Peoples Gas Light & Coke, said the acquisition by lease would improve operation and maintenance of its system. The facilities include a 20 and 24-in. line extending from Chicago's western city limits to a metering station at the Crawford plant of Peoples and a 24-in. line from Chicago's southern city limits to Peoples' Calumet station.

N. G. A. A. Report Show Gain In Natural Gasoline Output

Production of natural gasoline during March in the Mid-Continent and Gulf Coast areas showed a gain over February of nearly 4.5 per cent on a daily average basis, according to the monthly report of the Natural Gasoline Association of America.

Corrected to the basis of the 26-70 grade, equivalent production of all grades during March averaged 4,973,160 gal. daily. Production in February was 4,766,282 gal.

Production of the various grades in March, given as the 26-70 equivalent, and percentages of the total output follow: 30 lb. and above, 11,579,040 gal., 7.51 per cent; 26 lb., 46,841,530 gal., 30.38 per cent; 22 lb., 13,790,550 gal., 8.95 per cent; 18 lb., 22,282,268 gal., 14.45 per cent; 14 lb. 9,254,780 gal., 6 per cent; and 12 lb. and below, 50,419,797 gal., 32.71 per cent.

Symonds Reports $492,540 Profit From Big Inch Lines

Tennessee Gas & Transmission Co. realized a profit of $492,540 from its 4-month operation of the Big Inch system, Gardiner Symonds, president, told stockholders of the company in a recent letter.

Symonds said the company expects to complete by the end of this year current construction to bring its natural-gas pipe-line capacity to 400,000,000 cu. ft. daily, from its present throughput average of about 290,000,000 cu. ft. daily, and declared a favorable decision is expected "without undue delay" from the Federal Power Commission on the company's request for new facilities which will

Natural Gasoline

Production, Stocks of Natural Gasoline Gain

Production of natural gasoline during February averaged 14,797,000 gal. daily, an increase of 475,000 gal. over the January daily average of 14,322,000 gal. The February figure brought daily average for the first 2 months to 14,547,000 gal.

Stocks at refineries increased from 58,422,000 gal. on January 31 to 61,698,000 gal. on February 28 and at plants and terminals from 142,906,000 gal. to 148,723,000 gal.

Plants Under Construction

TORONTO, Ont. — Three bulk plants for the handling of liquid propane, an entirely new undertaking, are being erected by Imperial Oil, Ltd., in Ontario at Maple, Stratford, and Carleton Place. The plants will receive liquid propane from tank cars and transfer it to 100-lb. cylinders for distribution. Equipment at each plant will include a 15,000-gal. pressure tank. It is expected the first plant will be ready by July 1, 1947. further increase the company's transmission capacity to 600,000,000 cu. ft. daily.

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FOOT-LOOSE WITHOUT FANCY FEE

• Oilwell equipment is big. It costs a lot. Anyone who can make a derrick foot-loose saves a fancy fee for the oil industry in time and money.

Dresser Industries, through its member company, Ideco, designed a ninety-foot derrick to telescope ingeniously so that the whole rig can fit on a semi-trailer. Gypsy of the derricks, the *Rambler Rig* can roam the highways. To erect a permanent derrick takes days. The *Rambler* goes up in minutes. With the Rig is the Hydrair Hoist, utilizing air-actuated clutches and fluid power like that used in many ships and cars. So outstanding is this machine that it can hoist miles of drill pipe faster and smoother than any other equipment in its class.

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PAYNE Furnace Co., Beverly Hills, Calif.

ROOTS-CONNERSVILLE Blower Corp.
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SECURITY Engineering Co., Inc.
Whittier, Calif.

STACEY BROS. Gas Construction Company
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Cleveland, Ohio

REFINING

Baytown Plant Processes Billionth Barrel of Crude

The Baytown, Tex., plant of Humble Oil & Refining Co. has processed its billionth barrel of crude oil, company officials announced early this week.

The coastal refinery, largest in the nation, charged its first crude to stills in May 1920 as a 10,000-bbl. plant after almost a year of construction work. Plant facilities, expanded tremendously since then, now handle a crude throughput of about 200,000 bbl. a day. In April the refinery handled a record crude-charge average of 213,000 bbl. daily.

The Baytown plant gained recognition in 1944 as the first refinery in the nation to produce its billionth gallon of 100-octane aviation gasoline.

Root Will Modernize Newly Acquired Plant

Root Petroleum Co. will spend between $500,000 and $1,000,000 to modernize the 100-octane gasoline plant operated by Root during the war and which it recently bought from the Government for $1,100,000.

The plant includes catalytic cracking, gas concentration, isomerization, and alkylation units. It cost the government $5,579,224 to build.

New Company Buys Troy, Ind., Refinery

Troy Refining Co., Inc., newly organized firm headed by Max J. Lewis, who formerly operated Fort Erie Refining Co. at Bloomingdale, Mich., and later a plant at Niles, Ohio, has bought the refinery and connecting pipe-line system of Troy Refining Corp., Troy, Ind.

Construction plans now are being made to modernize the refinery and to double its capacity.

Bright-Stock Output Shows Slight Increase

Daily average production of bright stocks by Mid-Continent refiners increased from 8,127 bbl. in February to 8,461 bbl. in March, while viscous-neutral output dropped from 16,738 bbl. daily to 15,628 bbl. daily, according to a report by the Western Petroleum Refiners Association.

March daily average production of paraffin oils was 3,704 bbl., steam refined stock 837 bbl., and blended oils 18,466 bbl.

Tucker Car to Feature Fuel-Injection System

A fuel-injection system will replace the carburetor and high-frequency ignition system will replace spark plugs in the new Tucker automobile, scheduled for production in the near future, according to K. E. Lyman, Tucker development engineer.

The fuel-injection system sprays gasoline into the combustion chamber at 250 psi. on the backstroke of the piston, resulting in more complete combustion, Lyman said. The new ignition system, he said, helps break up the gasoline by an oscillating motion and produces a spark covering a wide area, resulting in a rapid, simultaneous combustion. Lyman said the innovations are expected to result in a 15 per cent saving in fuel costs.

Canadian Institute Will Meet in Banff June 8-11

A symposium on western resources, led by Dr. O. B. Hopkins, vice president of Imperial Oil, Ltd., will highlight the thirtieth annual conference of the Chemical Institute of Canada, to be held in Banff Springs Hotel, Banff, Alta., June 8-11.

A tour of oil refineries and chemical plants in Calgary, Turner Valley field, and other points of interest, ending at Vancouver, will follow the end of the conference.

Testing Toughness of Welded Joints Discussed

WASHINGTON.—Determining the toughness of welded joints in steel structures by measuring the load-carrying ability of specimen welds is proposed in a research report available from the Office of Technical Services, Department of Commerce. The report was prepared for the Watertown (Mass.) Arsenal Laboratory by Capt. S. A. Herres, now with Battelle Memorial Institute, Columbus, Ohio.

The proposal, according to the re-

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port, is that tests of speciments including welded joints should be compared with test results on similar specimens of unwelded metal. The tension side of the welded specimen should represent the irregular surface of the weld. In this way, the toughness or ability of the welded member to adjust its shape to withstand the load can be evaluated.

Acetylene Developments Described in Reports

A group of 13 reports presenting detailed information on German acetylene manufacture and the application of acetylene reactions to chemical operations is now being published by the Office of Technical Services of the Department of Commerce.

The information was prepared by investigators of the department's intelligence division and the British Intelligence Objectives subcommittee.

Fuel-Oil Use by Utilities Show 79.2 Per Cent Gain

Consumption of fuel oil in 1946 by electric-utility generating plants jumped 79.2 per cent over 1945, while coal consumption dropped 3.4 per cent and natural gas 5.9 per cent, according to a report of the Federal Power Commission.

Fuel-oil consumption during the year totaled 36,200,000 bbl., coal 72,200,000 tons, and natural gas 306,900,000 M.c.f.

Figures for March 1947 showed a 3.6 per cent drop in fuel-oil consumption, with 3,563,951 bbl. used during the month, compared to 3,696,062 bbl. in February. Stocks increased from 5,277,783 on March 1 to 5,454,132 bbl. on April 1.

Natural-gas consumption in March increased 13 per cent with a total of 23,413,289 M.c.f., against 20,600,630 M.c.f. in February. The March figure was 13.7 per cent above the total for March a year ago.

New Company Buys Sweeny, Tex., Refinery

Alma Refining Co., newly organized firm in which Phillips Petroleum Co. is the major stockholder, has purchased from War Assets Administration the 100-octane gasoline refinery at Sweeny, Tex., for $13,100,000.

The refinery property includes 30 buildings on 508 acres of land and was operated during the war by J. S. Abercrombie Co. and Harrison Oil Co.

The plant has a rated daily crude capacity of 25,000 bbl. and was built at a cost of $26,252,187.

Truck Shipments Up

Transportation of petroleum products by motor carrier increased 3.8 per cent during March and accounted for about 7 per cent of the 2,358,911 tons of motor freight carried during the month, according to American Trucking Associations, Inc.

Cutting-Oil Tests Described

Tests of corrosion suspectibility in four commercial cutting oils used with typical carbide tool tips at the Watertown (Mass.) Arsenal production shops are described in an American research report available from the Office of Technical Services, Department of Commerce. The report says moisture in chlorinated and sulfurized cutting oils may cause failure of the cutting edge of cemented carbide tool tips. Moisture weakens the tip by attacking the cobalt binder, according to the report which was reported for the arsenal by Murray Jacobson, chemical engineer.

N. Y. C. Orders Diesels

NEW YORK.—Seventy diesel-electric locomotives, both passenger and freight, have been ordered by the New York Central system. The units will cost about $12,000,000. The company now has 158 diesel-electric units in operation and in 1946 ordered 66 units, many of which already have been delivered.

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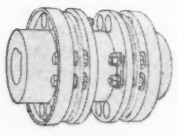
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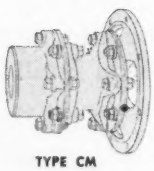
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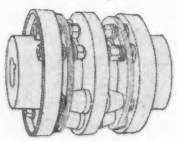
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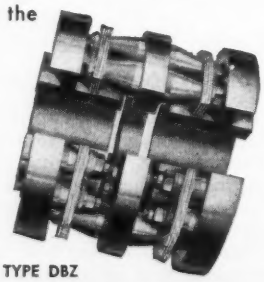
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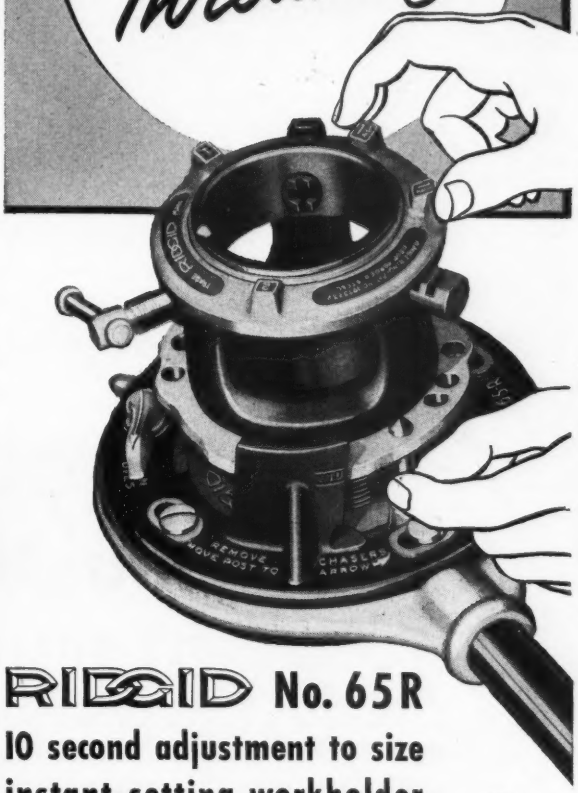

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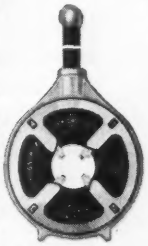

Every 65R must cut a perfect thread before it leaves the factory.

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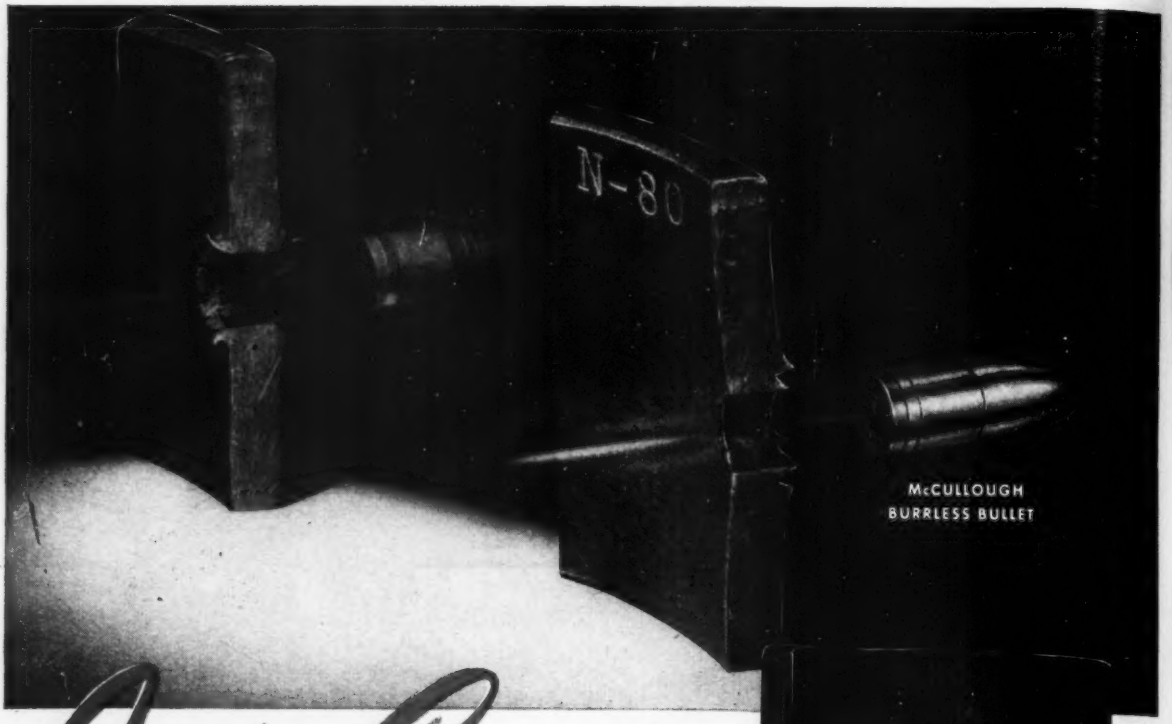

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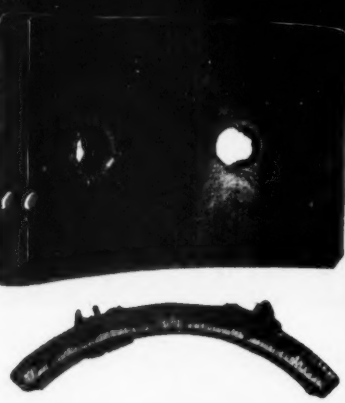
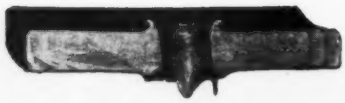


...the first bullet to give both burr-free holes and full projectile efficiency. The unretouched photographs on the right–N-80 casing, 7⅝", 39 lb., perforated simultaneously by McCullough's BURRless Bullet and a regular bullet–show you more clearly than a thousand words that the McCullough BURRless Bullet gives you a perforation completely free from inside burr, eliminating the need for casing scrapers, preventing any possible damage to swabs or packers, saving you tool rental, saving you rig time, saving you money.



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PIPE LINES

United Project Is Nearing Completion

CONSTRUCTION of 86 miles of 6-in. gas-transmission pipe lines and nine measuring stations in the Jackson, Miss., district by United Gas Pipe Line Co. last week was reported in the final stages. Work on the new lines, which will serve nine towns in four counties in Mississippi, was started in November 1946.

The new pipe line originates at the Jackson compressor station site, 10 miles east of Jackson, Miss., and runs in an easterly direction through Rankin, Scott, and Newton counties; then north to Philadelphia, Miss., terminating in Neshoba County.

Actual construction was started on the line November 22, 1946, and all contract work on the main line was completed by April 27. Adverse weather conditions throughout the period of construction, together with the rugged country along the right-of-way, offered considerable hindrance to its progress.

Pipe Salvaged

Due to pipe shortage, it was necessary to use various weight pipe, ranging from 8 to 17 lb. per foot, in addition to pipe salvaged from the company's other lines. Only a small amount of the heavier pipe was available, and this was used for highway and railroad crossings.

The remainder of the line was said to be made up of "invasion" pipe, so-called because it was designed for extending fuel lines to invasion forces in the war. This pipe was received in 20-ft. lengths, having 6⅝-in. o.d. adapters on each end for the Victaulic couplings used in Army pipe-line operations. Since the line was of solid-weld construction, these couplings were cut off.

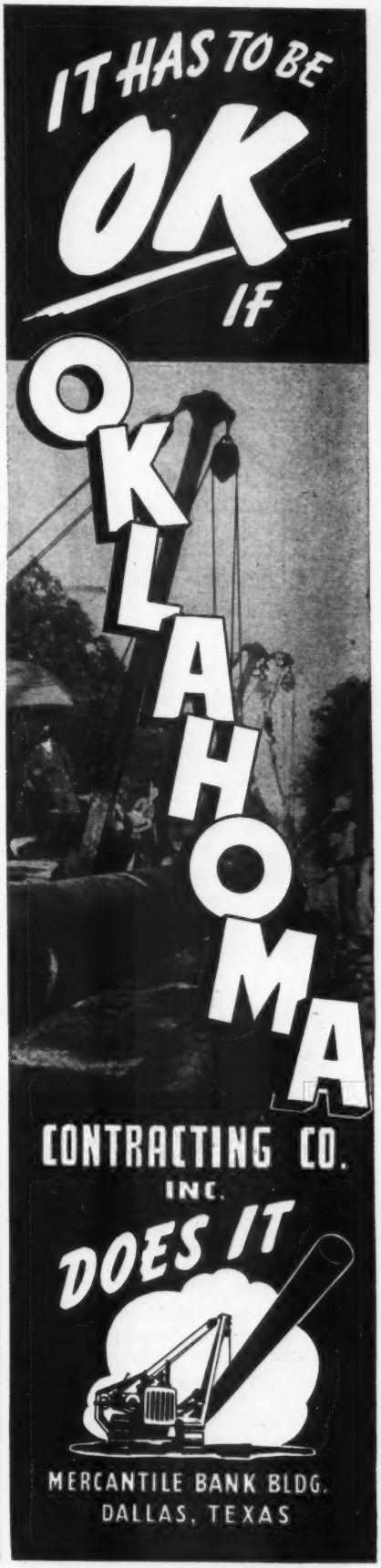
In using the odd-size pipe, cleaning problems were encountered. The "invasion" pipe being 6-in. o.d., and the remainder 6-in. i.d., only a part of it could be cleaned by a plug or go-devil, since the smaller pipe slipped into the ends of the larger for welding, and the inside walls offered an obstruction.

Standard measuring stations with positive displacement-type meters were installed at all of the nine towns serviced by the line.

Construction of the Jackson-Philadelphia line was a contract job, with company personnel acting in engineering and inspection capacities. Meter and regulator stations were built by regular crews of the Jackson district organization.

Distribution systems have been completed at Brandon and Pelahatchie and are in use. To finish the installation for all the towns, a total

Arab tribesmen with chiefs acting as foremen dig ditch for Iraq Petroleum Co.'s Kirkuk-Haifa & Tripoli 1,200-mile 16-in., crude-oil pipe line. Work shown is being done near H-2 camp, 360 miles west of Baghdad



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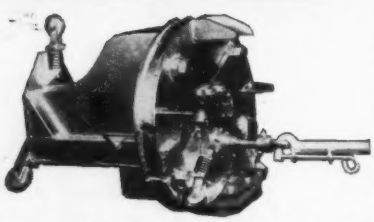

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of 516,933 ft. of pipe will be required. This is broken down into 11,310 ft. of 6-in.; 37,082 ft. of 4-in.; 211,460 ft. of 2-in.; 61,944 ft. of 1¼-in.; and 195,137 ft. of 1-in. pipe.

United Asks to Create New Pipe-Line Subsidiary

Securities and Exchange Commission has been asked by United Gas Corp., Shreveport, to approve the creation of Atlantic Gulf Gas Co., which would carry out United's obligations to construct and operate natural-gas pipe-line properties in southern Alabama and Georgia, northern Florida, and southeastern South Carolina.

United, which now has two wholly owned subsidiaries, Union Producing Co. and United Gas Pipe Line Co., engaged in the natural-gas business, proposes to subscribe for all Atlantic Gulf's initial issue of common stock for $1,000,000 cash.

Hearing on Natural-Gas Projects Set for May 26

Hearings on applications of Southern Natural Gas Co. and East Tennessee Natural Gas Co. for authority to construct and operate natural-gas pipe-line facilities have been set for May 26 by the Federal Power Commission.

Southern Natural is proposing to increase the capacity of its system from 255,000,000 cu. ft. daily to 384,000,000 cu. ft. and to serve new markets in Tennessee, Mississippi, Alabama, and Georgia. East Tennessee Natural, a recently organized company, proposes to build and operate facilities with a daily capacity of 62,325,000 cu. ft. for delivery to Chattanooga and Knoxville, Tenn., and surrounding areas.

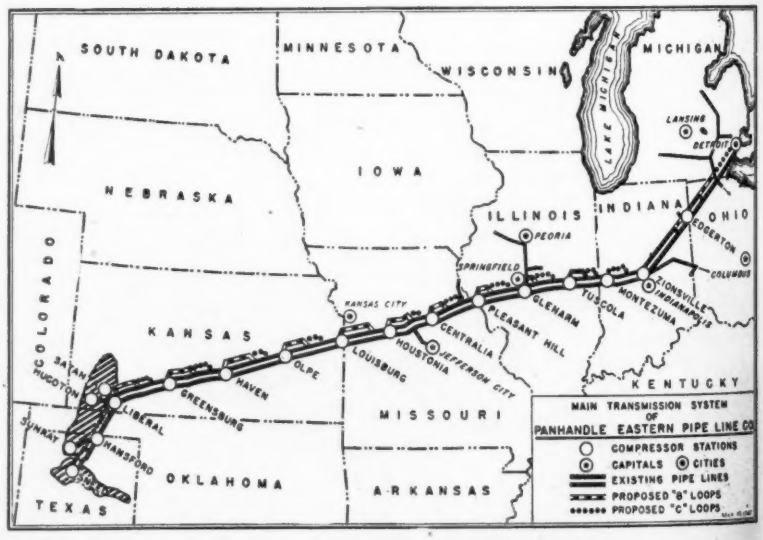
Southern Natural's plans for 1947 include construction of additions to main-line compressor stations totaling 8,000 hp., 18½ miles of 20 and 22-in. loop line paralleling the main line, and a total of 15½ miles of 6⅝-loop line along branch lines. During 1948 the company plans to add another 37,000 hp. to main-line compressor stations, 3,600 hp. to branch-line stations, and one 1,000-hp. compressor station, and plans to construct 14 miles of 20-in. main-line loop and 33 miles of 12¾-in. branch-line loop.

East Tennessee proposes construction of 186½ miles of 16-in. line and about 112 miles of 12¾-in. line, with laterals to various communities.

Texas Eastern Expansion Is Opposed in New York

Expansion plans of Texas Eastern Transmission Co., operator of the Big Inch system, are being opposed by the New York Public Service Commission.

In a letter to the Federal Power Commission, Chairman Milo R. Maltbie asked that permission to construct additional pipe lines to serve new areas not be granted "until it is certain beyond any reasonable doubt that the supply of gas to present residential customers in New York State will be ample under the most adverse weather conditions."



Construction Program "C" of Panhandle Eastern Pipe Line Co., involving 355.76 miles of loop lines and an addition to existing compressor stations of 37,600 hp., is indicated by dots on the accompanying map of the company's lines. The new lines will consist of 26-in. o.d. pipe built for 900 psi. Broken lines show construction program "B," authorized November 30. Application for a certificate of convenience and necessity for Program "A" already has been filed. The company also has scheduled considerable expansion of its field program

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Gas Industrial Line Nearing Completion

The 136-mile, 14-in. natural-gas pipe line being laid for Gas Industrial, S.A. will be completed toward the end of this month.

Fast progress has been made by the contractor, Contrata del Norte, S.A., affiliated with O. C. Whitaker Co. Early this week less than 40 miles remained to be laid. Recently pipe was reported laid over some stretches of the route at the fast rate of 3 miles per day.

Ditch was dug weeks in advance by a Mexican contractor; this was practicable because of the prevailing dry season. The job is supervised by T. M. Tatum, spread man, whose headquarters office address is: Apartado 398, Monterrey, N.L., Mexico.

Argentina to Fabricate Pipe for Gas Line

Direccion del Gas del Estado, the gas department of the Argentine Government, has arranged to fabricate pipe to be used in the initial construction of the 1,200-mile Comodoro Rivadavia-Buenos Aires natural-gas trunk transmission line.

A fabricating machine has been shipped for installation at Buenos Aires where it will be operated for welding pipe made from sheet steel shipped to Argentina. The present program calls for starting the building of the trunk line at the Buenos Aires end with Argentine labor supervised by the organization of Direccion del Gas del Estado.

Teofilo Tabanera, assistant general manager. Direccion del Gas del Estado, is now on a trip through England and European countries to negotiate for equipment for the project.

Aluminum Homes Being Built In Contractor's Warehouse

The extensive World War 1 Army depot at Chamblee, Ga., acquired for a warehouse by William Brothers Corp. during 1941 construction of the Plantation Pipe Line Co. system has been recently enlarged to provide for the expanding aluminum fabrication operations in which this firm of pipeline contractors is engaged.

In addition to fabricating aluminum windows in recent months, this organization has built more than 100 insulated aluminum houses especially designed for construction and operating personnel of South American oil companies. These houses, 16 by 16 ft., are made for accommodating four men. The Chamblee shop, supervised by B. E. Barnes, Atlantic manager of Williams Brothers, is building 300 more of these houses for South America and the Middle East.

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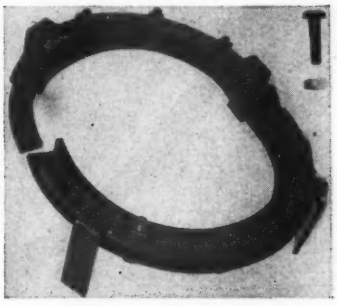

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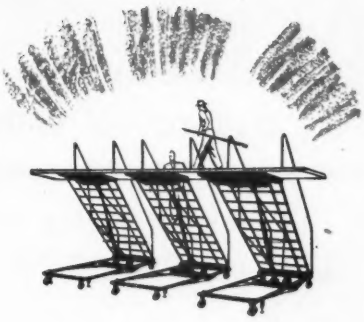
Welded seamless steel tubing construction assures maximum strength and rigidity for life. Platforms are actuated by manually-operated, powerful hydraulic pumps and locked in position by safety pin. Stair treads are self-leveling. Hand rail makes climbing easy, safe as a stairway! The special AEROSTAND, illustrated above, has static load capacity of 750 lbs. Four locking swiveling casters and truck locks hold it stationary. Platform, 4 x 4 feet, rises from 19 to 26 feet. Base is 10 x 14 feet. Weight is 1100 lbs.

Correct application of AEROSTANDS, as suggested across the page, can save time and money on many overhead industrial applications—and pay for themselves in a short time. These two models, or their modifications, meet practically all industrial requirements.

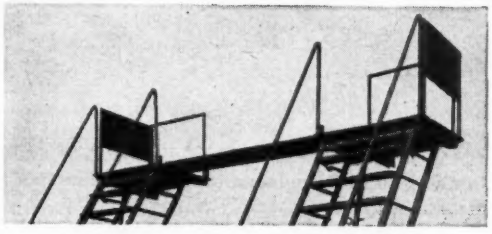
MODEL 10 AEROSTAND

Static load capacity, 1500 lbs. Platform can be raised from 3 to 10 feet in seconds! Similar models provide 12, 14 and 16-foot working levels. Has locking 8-inch casters (or airwheels) and truck locks to hold stationary. Base is 4 x 11 feet, platform 4 x 4 feet. Weight, 850 lbs.

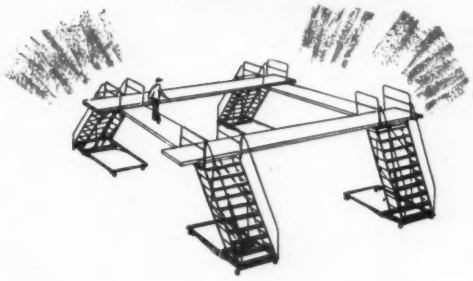


Two or more AEROSTANDS, side by side, with connecting platform.

MODEL 10 AEROSTAND ARRANGEMENTS



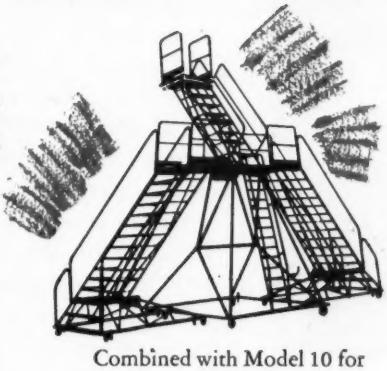
Platform extensions for two AEROSTANDS



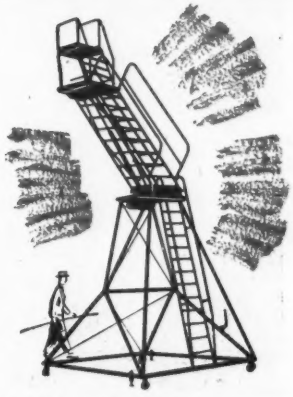
Group of four, raising plank platforms as work progresses.

MODEL 20 AEROSTAND ARRANGEMENTS

Two-side approach arrangement — self-bracing for heavier static loading.



Combined with Model 10 for flexibility of working levels.



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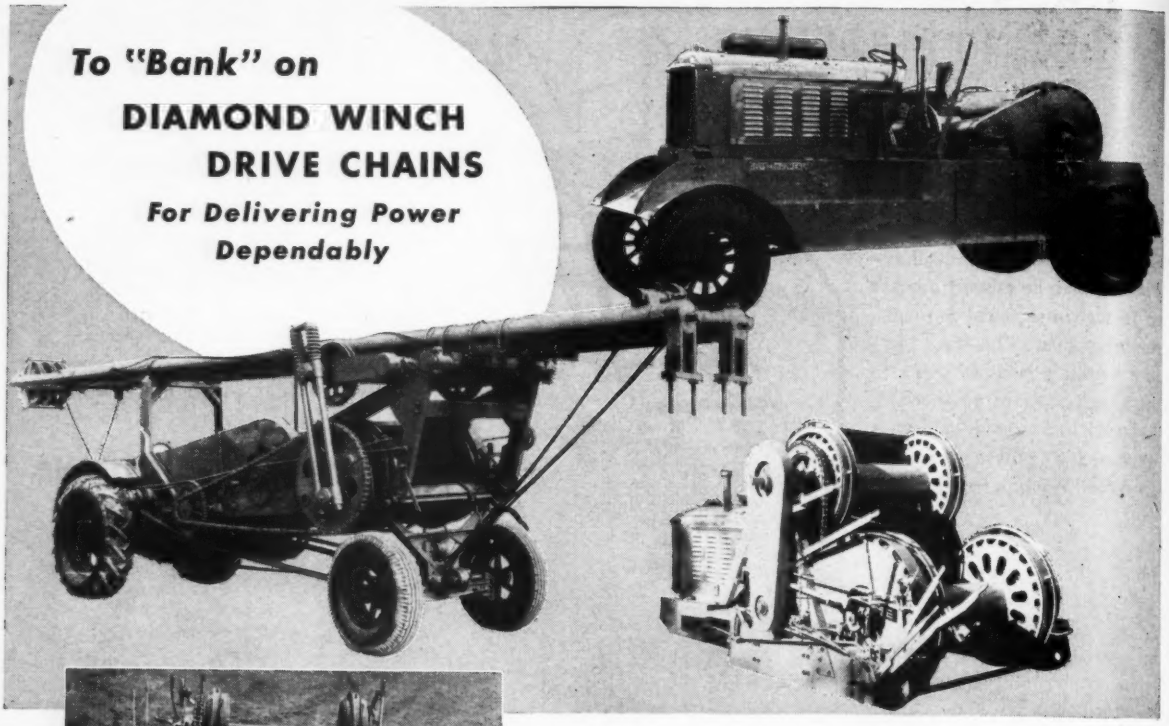

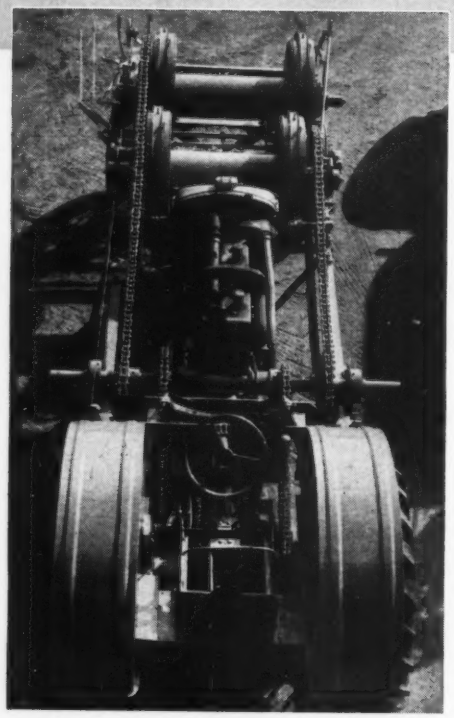

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Exploration and Drilling

Exploration in Appalachian Area

by Charles J. Deegan

IT may be a surprise to many oil men to find that one of the virgin territories for modern oil exploration lies in the Appalachian area. The birthplace of the modern petroleum industry is scarcely the area one would consider virgin territory, yet it is true. The reason is obvious, once brought to light. Here the industry learned its first lessons in exploration, but then began moving steadily west and south. Knowledge and techniques of exploration continually improved, but territory just beyond always seemed the place to test the new knowledge and tools.

A new generation of geologists now working in the Appalachian region has decided the time is ripe to reverse the trend. They want to take all the knowledge of how a modern exploration campaign should be conducted and apply it to the practically untested deep possibilities in the birthplace of the industry. After several years of organization work in getting started, they are firing the first big gun of their campaign in Pittsburgh this week.

The Pittsburgh Geological Society is sponsoring a symposium of papers on the Ordovician of the eastern area. The Ordovician has produced large amounts of oil in other parts of the United States, yet lies practically unknown and relatively untested under most of the eastern part of the country. The first step in a modern exploration campaign is to gather and interpret all the known data on an area into a coordinated study of the regional geology. That is exactly what is being done at Pittsburgh this week.

The program is designed to bring to light all available knowledge of the Ordovician sediments in an area extending from the upper peninsula of Michigan, and Wisconsin-Illinois on the west, eastward through New York, southwest through Pennsylvania, Maryland, West Virginia, Kentucky, and Tennessee, and of course including the data available in Indiana and Ohio in the center.

George V. Cohee discusses "Cambrian and Ordovician Rocks of Michigan and Adjoining Areas." He includes the data known from outcrops, which extend from northern Michigan southward into Wisconsin and Illinois, and eastward from the upper peninsula into Ontario. Of particular interest are the data he presents regarding thinning over the Findlay arch in southeastern Michigan and northwestern Ohio, followed by subsequent thickening eastward into the Appalachian basin. Perhaps, of even more immediate importance is his conclusion that the present Michigan basin existed in nearly its present form as early as Middle Ordovician, indicated by thinning of Middle Ordovician members over major anticlinal folds in the basin.

C. R. Fettke, in "Subsurface Ordovician of New York, Ohio, Pennsylvania, and West Virginia," builds such sections and stratigraphic data as are possible from the few deep wells that have penetrated the Ordovician in the deeper parts of the Appalachian basin, plus the shallow wells around the edges. This is complemented by E. T. Heck, whose paper summarizes the available information on the subsurface rocks of New York State of Trenton and sub-Trenton age. This is supplemented by probable structural maps on top of the Trenton and on top of the Pre-Cambrian.

Frank M. Swartz, in "Trenton and Sub-Trenton Sediments at the Outcrop in New York, Pennsylvania, and Maryland," discusses, on the basis of outcrop data, the characteristics and regional changes of the Lower, Middle, and Upper Cambrian, Lower and Middle Ordovician in the three states. He gives consideration to the probable geography of deposition and contemporaneous diastrophism, and presents preliminary isopachous maps.

C. E. Prouty, in "Trenton and Sub-Trenton Stratigraphy of the Northwest Outcrop Belts of Virginia and Tennessee," then picks up the trend. He develops the influence of the Clinch arch, which is probably an extension of the Adirondack arch to the northeast, and possibly in part is coincident with Ulrich's Rome Barrier.

A. C. McFarlan, in "Trenton and Pre-Trenton of Kentucky," brings up to date the stratigraphy, correlations, and characteristics of these formations as now worked out by a number of individuals. This work has resulted in some modifications of the previously accepted stratigraphic alignment.

Coleman D. Hunter, in "The Subsurface Ordovician of Kentucky," discusses the successive waves of interest over the past 15 years in oil and gas possibilities in the Ordovician and Cambro-Ordovician formations of Kentucky. Ninety-nine wells have been drilled through the entire Ordovician section to the Knox dolomite of Cambro-Ordovician age, including one 6,117-ft. test which went into rhyolite porphyry of the basement rock.

Wayne, Clinton, Cumberland, and McCreary counties in south central Kentucky have had commercial oil for many years from the Sunnybrook Trenton sands. In the late thirties and early forties, there was an interest in drilling to test the St. Peter horizon above the Knox, but six or seven tests found the true St. Peter absent or nearly so.

Now there is a revival of interest, but with older formations below St. Peter as the objective. Several tests with good shows, and possibly one small producer in Clay County, have been drilled. To avoid excessive depths, most drilling has been on or near the crest of the Cincinnati arch.

Robert C. Lafferty, in "The Subsurface Ordovician of Southern Ohio," then picks up the area in southern Ohio between 40° North Latitude and the Ohio River, on the east flank of the Cincinnati arch. His isopachous maps and cross-sections show this to be a subsiding area with the Trenton thickening approximately 500 ft. from Cincinnati, eastward to the limits of the area. Present production in the area aligns itself in northeast-southwest trends, suggesting the Epi-continental shelf is a controlling factor to be considered in Trenton and deeper prospecting.

Marshall Kay, in "Middle Ordovician Margining the Allegheny Synclinorium," summarized the classification of the sequences along the eastern and northern margins of the Allegheny synclinorium. He illustrates the lithologies and thicknesses of successive groups in paleolithologic and isopachous maps that suggest the nature of the subsurface section in the large region that has not been explored directly.

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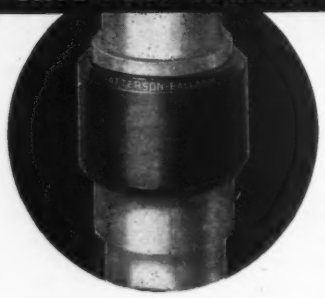

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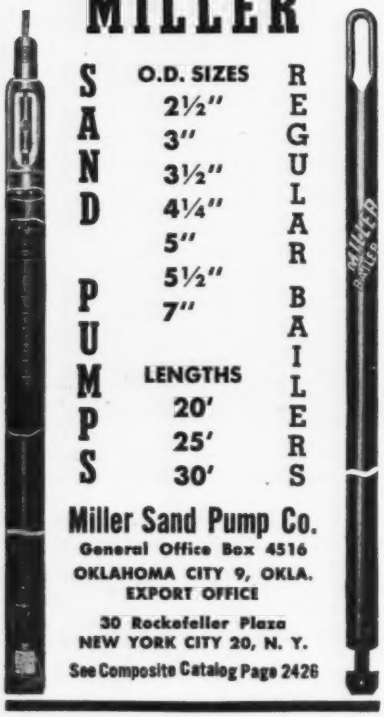

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SOUTHWEST TEXAS

New Shallow Pool For Webb County

CORPUS CHRISTI.—In Webb County, approximately 5 miles southwest of the Adami field, M. L. Massingill and 56 Petroleum Co. 2 George B. Parr is being completed as a new oil-field opener. Saturated oil sand in the Mirando zone at 880-91 ft. were cored. An electric log was run to total depth of 891 ft., and 5½-in. casing set at 880 ft. with completion being made through open hole at 880-891 ft. Locations for Nos. 3 and 4 Parr have been made by the operators.

Two miles southeast of the Cedro Hill field in western Duval County, Rowden & Rowden et al 1 John W. Akin, wildcat, opened a new gas field. Drilled to a total depth of 2,458 ft., with 5½-in. casing set on bottom, this well flowed an ungaged amount of gas with 900 psi. shut-in pressure, through perforations at 2,444-47 ft. Electric log showed sand to be at 2,443-48 ft. This discovery is located in GB&CNG Survey 186, 11 miles south-southwest of Freer, and 2 miles northeast of the East Peters field.

P. R. Rutherford 12 Henry Schirmer has opened a new deeper oil pay zone for the Bonnie View field in Refugio County. Drilled to a total depth of 6,916 ft., this well flowed a potential gage of 139.78 bbl. of 40.5°-gravity oil per day through an X-32 (⅛-in. plus) choke, with gas-oil ratio of 2,092 cu. ft., tubing pressure 1,350 psi., casing pressure 2,010 psi. Production is through perforations at 6,178-84 ft. The 5½-in. casing was set to 6,451 ft. This well is located in Section 26 of Johnson and Pugh Subdivision.

Mid-Continent Petroleum Corp. 1 John Sommer, discovery well of a new oil field, approximately 1½ miles south of Agua Dulce townsite and 2½ miles west of Agua Dulce field, and 3 miles north of Stratton field, in Nueces County, flowed a potential gage of 121.76 bbl. of 36°-gravity pipe-line oil per day through a 3/16-in. choke, with gas-oil ratio 432 cu. ft., tubing pressure 420 psi., casing 930 psi. Production is through perforations at 5,982-88 ft. Total depth is 7,008 ft., with 5½-in. casing set to 6,085 ft. for completion. This well is located in center of NE NW Section 24, Benton Pasture subdivision.

Atlantic Refining Co. 1 J. R. Foster, wildcat test in the Wilcox zone approximately ⅝ mile north of the Eagle Hill field, J. R. Foster Survey 270, in northwestern Duval County, recovered a 1,000-ft. water cushion and 300 ft. of mud cut with condensate in a 20-minute drill-stem test at 7,027-40 ft. in upper Wilcox. Working pressure was 40 psi. through ¼-in. chokes top and bottom. Operators are now coring ahead below 7,072 ft.

Renwar Oil Corp. 1 W. B. McCampbell et al, wildcat in northern Nueces County, ½ mile east of the Turkey Creek field, in BS&F Survey 421, is reported to have flowed pipe-line oil through perforations at 5,542-52 ft., and is now shut in for storage before running potential gage. Total depth is 9,015 ft., and 5½-in. casing is set at 8,650 ft.

There were 44 new locations reported this week, 12 being wildcats, 2 each in Duval, Hidalgo and Jim Wells counties and 1 each in Aransas, Dimmit, Hays, San Patricio, Starr and Webb counties. The 26 completions included four successful exploratory wells, 1 new oil pool in Nueces, and three new pays, one in South Haldeman field, Jim Wells; La Goria field, Jim Wells, and Borregas field in Kleberg County. Four dry wildcats were completed, one each in Atascosa and Guadalupe, and two in San Patricio counties.

SOUTHWEST TEXAS SUCCESSFUL WILDCATS

Jim Wells County: New oil pay South Haldeman field—Magnolia Pet. Co. 7 Seeligson Unit 4, Lot 75, Sec. 62, R. P. Haldeman Subd. of Seeligson Ranch, 3 mi. NW of Premont and 1 mi. W of Seeligson field, top pay 5,563 ft. (zone 22), TD 6,001 ft., perf. 5,563-72 ft., IP: 54 bbl. oil per day through a ¼-in. choke, gas-oil ratio 338 cu. ft., TP 300 psi., casing sealed, gravity 40°, no water.

New oil pay in La Gloria field: Republic Nat. Gas Co. 2-A Chas. L. Scott, Tr., Lot 9, Blk. 4, subd. of lands adjoining townsite of La Gloria, dual completion: top pay 6,374 ft., TD 6,690 ft., perf. 6,374-81 ft., IP: 114 bbl. oil per day through X-31 choke, gas-oil ratio 1,464 cu. ft., CP 1,250 psi., gravity 43°, no water. Top new pay 6,598 ft., perf. 6,598-6,604 ft., IP: 109 bbl. oil per day through an X-29 choke, gas-oil ratio 880 cu. ft., TP 975 psi., grav. 39°, no water.

Kleberg County: New oil pay Borregas Field—Humble 10 King Ranch-Borregas, in Santa Gertrudis gr., top pay 6,526 ft., TD 8,503 ft., perf. 6,526-36 ft., IP: 86 bbl. oil per day through ⅛-in. choke, gas-oil ratio 988 cu. ft., TP 620 psi., csg. sealed, grav. 41°, 1.2 per cent water.

Nueces County: New pool discovery—Mid-Continent Pet. Corp. 1 John Sommer, Sec. 24, Benton Pasture Subd., 1½ mi. S of Agua Dulce, 2½ mi. W of Agua Dulce field and 3 mi. N of Stratton field, top pay 5,982 ft., TD 7,008 ft., perf. 5,982-88 ft., IP: 122 bbl. oil per day through 3/16-in. choke, gas-oil ratio 432 cu. ft., TP 420 psi., CP 930 psi., grav. 36°, no water.

SOUTHWEST TEXAS WILDCAT FAILURES

Atascosa County: Eugene W. Gill 1 D. C. McAda, in Alfred A. Lee Sur., 3 mi. N of Campbellton, top of Wilcox 2,950 ft., dry, TD 5,810 ft.

Guadalupe County: Wiegand Bros. 1 Pat H. Baker, in Wakefield & Stewart Sur., 5 mi. SE of Kingsbury, dry, TD 2,540 ft.

San Patricio County: Republic Nat. Gas Co. 1 J. B. Hardwicke (North Odem area), Blk. 48, Wedler & Odem Subd., 3 mi. NW of Odem, old well drilled deeper, old TD 6,992 ft., dry at new TD 7,856 ft.

Southern Minerals Corp. 3 Katherine Clifton, in James B. Wilson Sur., 1 mi. S of Tynan, dry, TD 4,738 ft.

MICHIGAN

New Field Opened In Bay County

SAGINAW.—Michigan's oil industry got a moderate lift this week as the Reese-McClanahan Oil Co. 1 Mercer-Knoodle wildcat in Section 33, Mt. Forest Township, Bay County, flowed 77 bbl. in 6½ hours immediately after treatment with 1,000 gal.

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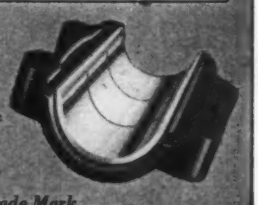

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of acid. The well then was shut down to await further testing. Production was from 3,030 ft. Nearest production is 6 miles southeast from a Shell Oil Co. wildcat developed a few months ago, still producing, but with its offsets dry. However, within a 3-mile radius of the Reese-McClanahan wildcat hardly any exploratory work has been done. Reese & McClanahan have another location ¾ mile due east on acreage subleased from Shell Oil Co. Shell, Pure, Sohio, Superior, Skelly companies and several independents have the entire area under lease and additional drilling in the vicinity of the discovery, 4 miles west of Pinconning is assured. One factor adding interest to the discovery is its proxmity to the Arenac County field where heavy but spotty production has been obtained in the past few years.

Other field activities included 9 completions for 4 small oil wells, 2 gas wells and 3 dry holes, while 14 new locations were reported. The new producers are rated at around 20 bbl. a day, one in the Algome field, Kent County, one in Arbela of Tuscola County, two others in Bay County in the Monitor field. The gas wells were small Clare County completions.

Three of the new locations are in Clare County, two each in Allegan, Kent and Newaygo, one each in Roscommon, Livingston, Oceana, Barry and Isabella.

MICHIGAN WILDCAT FAILURES

Lapeer County, Burnside Township: C. & G. Wilson 1 Bailey, SW SW SW 33-9n-12e, dry in Detroit River formation, TD 2,580 ft.

Tuscola County, Akron Township: E. Edwin Brehm 1 Begle, NE NE NE 21-15n-8e, dry, TD 3,685 ft.

N. CENTRAL TEXAS

Ellenburger Pays Off In Fargo Area

WICHITA FALLS.—Ellenburger pay for the Fargo area of northwestern Wilbarger County was confirmed last week at Humble Oil & Refining Co. 6 Virginia McCaleb, Section 34, Block 15, H&TC Survey, when it flowed 107 bbl. of oil into tanks through ¾-in. choke the first hour, and 102 bbl. of oil the second hour of a flowing test. The well was drilled to 6,345 ft. Flow started when operators drilled plug set at 6,242 ft. Regular pay for the field runs from the Cisco to the Strawn, of the Pennsylvanian. Previous Ellenburger exploration in the field was said to have been made by Amerada Petroleum Corp., which had some oil in that zone, but plugged back for completion in the shallower pay. Amerada was reported to have staked location for another Ellenburger test at its 5-B Goodpasture in Section 35, Block 15, H&TC Survey. Location is 898 ft. southeast of Humble 6 McCaleb.

A new pay formation, in the Gray sand, on the north flank of the North Novice field, Coleman County, was found by Sadler & McKissick 2 Sealy-Smith Foundation, in the GHH Survey 175, and 1½ miles northeast of Novice. In requesting a new pool designation and discovery allowable from the Railroad Commission, operators reported the sand pay was logged at 3,704 ft., with total depth at 3,729 ft. On completion tests the well made 490 bbl. of 40°-gravity oil, flowing through 20/64-in. tubing choke. Gas-oil ratio was 1,250 cu. ft.

In Clay County, Continental Oil Co. 1 Keen, Block 2,698, TE&L Survey, 4 miles south of the Joy field, which originally started as a stratigraphic test, was perforating casing in Caddo limestone at 5,465-90 ft. Oil showings were logged at that interval and on a drill-stem test it recovered 800 ft. of gas-cut mud in 5 minutes, before packer failed. Electric survey indicated top of the Caddo at 5,465 ft., Barnett shale at 6,114 ft., and top of the Ellenburger at 6,315 ft. Total depth was 6,518 ft.

NORTH CENTRAL TEXAS SUCCESSFUL WILDCAT

Wichita County: Consolidated Oil Co. 1 Alice Daves, Blk. 14, DCSL Sur., 7 mi. SW of Wichita Falls, pumped 70 bbl. of 42°-gravity oil a day, top Barnett 5,382 ft., pay 5,324-5,525 ft., TD, acidized, elev. 1,000 ft.

NORTH CENTRAL TEXAS WILDCAT FAILURES

Archer County: McMahon & Kelleher 1 J. H. Turbeville, Blk. 157, R. Carson Sur., 8 mi. NW of Archer City, dry, TD 1,508 ft. in salt water.

Cooke County: Lloyd Oil Co. 1 Myrtle Norman, J. Hamilton Sur., A-491, 1 mi. S of Woodbine, dry, TD 4,565 ft. in shale.

WEST CENTRAL TEXAS SUCCESSFUL WILDCAT

Coleman County: H. T. Owens et al 1 M. B. Hill, Sec. 22, H. Warfield Sur., Coleman County field area, 4 mi. W of Novice, flowed 31 bbl. oil a day, plus 8 per cent water, pay 3,714-44 ft., TD 3,751 ft., GOR 1,000:1.

WEST CENTRAL TEXAS WILDCAT FAILURES

Callahan County: Standard Oil Co. of Kansas 1 R. L. Murphy, G. D. Spottsworth Sur., 7 mi. NW of Cross Plains, dry, TD 5,131 ft., Home Creek 1,437 ft., Adams 1,700 ft., Caddo 3,070 ft., elev. 1,913 ft.

Jones County: Exploration Drilling Co. 1 G. C. Maynard, Blk. 1, Lodge 338, Goliad CSL, 8 mi. SE of Hamlon, dry, TD 4,498 ft., Flippen 2,829 ft., Upper Hope 2,997 ft., Swastika 3,211 ft., Palo Pinto 4,340 ft., elev. 1,821 ft.

Stephens County: J. W. Sorrels 1 H. Thompson, Sec. 450, SPRR Sur., 3 mi. SE of Gunsight, dry, TD 4,118 ft., Caddo 3,175 ft., Ellenburger 4,045 ft., elev. 1,464 ft.

Prairie Oil & Gas Co. 2 W. M. Chaney, Sec. 2953, TE&L Sur., 15 mi. SW of Breckenridge, dry, TD 3,798 ft., Caddo 3,362 ft., elev. 1,287 ft.

Taylor County: G. H. Brodie 1 John Meeks, Sec. 63, Blk. 19, T&P Sur., 4 mi. SW of Merkel, dry, TD 3,975 ft., Saddle Creek 2,783 ft., Flippen 2,810 ft., Gunsight 3,130 ft., Swastika sand 3,215 ft., Reef limestone 3,810 ft., elev. 1,951 ft.

Throckmorton County: Panhandle Refining Co. 1 L. A. Spain, Sec. 931, TE&L Sur., 4 mi. NW of Woodson, dry, TD 4,788 ft., Caddo 4,116 ft., Mississippi 4,758 ft.

SOUTH LOUISIANA

1½ Mile North Extension For Houma Field

NEW ORLEANS.—Houma field production has been extended 1½ miles northward by Union Oil Co. of California 1 J. C. Dupont, Inc., 45-16s-17e, in Terrebonne Parish. Drilled to a total depth of 12,074 ft., production is through perforations at 11,930-950 ft. This is approximately 1,600 ft. below the regular producing level in the field proper. No gage has been made, but the well flowed gas and condensate through a 3/16-in. choke with 4,750 psi. pressure on the tubing. The 5½-in. production casing was cemented 4 ft. off bottom.

Union Producing Co. and M. H. Marr 1 A. N. Floyd, ½ mile north extension test to deep Tuscaloosa sand production in the Big Island field, Rapides Parish, is still cleaning. It flowed 200 bbl. of oil in 24 hours through a 12/64-in. choke, showing a little wash water. Flowing pressure on tubing was 1,700 psi., and 1,525 psi. casing pressure. Perforations are at 9,654-80 ft., and 2⅞-in. tubing is at 9,662 ft. Total depth is 9,876 ft., with 7-in. casing cemented at 9,784 ft.

A new gas-condensate sand for Bayou Sale field, St. Mary Parish, has been opened by The Texas Co. 4 State-St. Mary Parish Land Co., Unit 2, 11-17s-9e. Drilled to a total depth of 10,285 ft., on potential

test it flowed 1,630,000 cu. ft. of gas per day and an ungaged amount of condensate through a ½-in. choke, tubing pressure 2,600 psi., shut-in. pressure 3,750 psi., gravity 50.5°, no water. Production is through perforations at 9,900-50 ft.

Stanolind Oil & Gas Co. 1 E. M. Watkins, wildcat in 23-13s-1w, East Florence area of Vermilion Parish, has started kicking again, and is showing salt water and gas. This well blew out of control at original total depth of 11,115 ft., where pipe became stuck. The hole was plugged back to 4,030 ft. and sidetracked. Present drilled out total depth is 11,080 ft.

Gulf Refining Co. 1-A A. M. Cotten et al, wildcat 2 miles southeast of Bayou Boullion production in Iberville Parish, 49-9s-2w, failed to flow on an initial test and operators squeezed for another try. Total depth is 11,876 ft. in sand, and 5½-in. casing is cemented to 10,522 ft., and perforated in two sections, 10,332-354 ft. and 10,374-386 ft. Well was swabbed with no results.

There were 21 new locations reported this week, with only one being a wildcat, in West Baton Rouge Parish. St. Charles Parish received the greatest new activity with four new locations while Acadia and Lafourche each received three new starts. All eight completions were successful with one exploratory well which opened a new gas-condensate sand in St. Mary Parish, Bayou Sale field.

SOUTH LOUISIANA SUCCESSFUL WILDCAT

St. Mary Parish: New gas-condensate pay, Bayou Sale field — The Texas Co. 4 State-St. Mary Parish Land Co., Unit 2, State Lease 329, 11-17s-9e, TD 10,285 ft., perf. 9,900-50 ft., IP: 1,630,000 cu. ft. gas and ungaged amount condensate through ½-in. choke, TP 2,600 psi., SIP 3,750 psi., gravity 50.5°, no water.

ROCKY MOUNTAIN

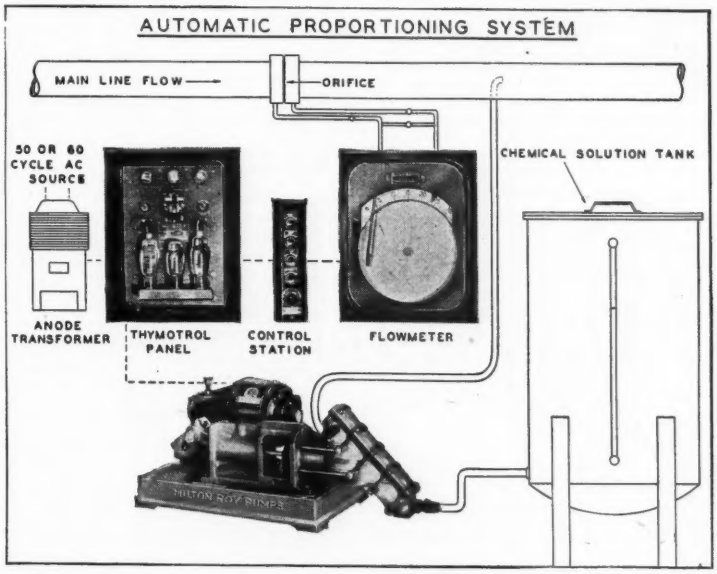
Green River Basin Wells Ready for Testing

DENVER.—The two exploratory wells of the Mountain Fuel Supply Co. on the Church Buttes structure, Uinta and Sweetwater counties, southwestern Wyoming, which are expected to disclose the probable areal extent of the discovery made in the spring of 1946, have stopped drilling, and are being prepared for testing. The 2 Unit well which is located 4¾ miles northeast of the discovery, in Sweetwater County, was drilled to 12,459 ft., and is conditioning hole to run casing. It is in the NE NE NE 22-17n-112w. No. 3 Unit, NE SW NE 12-16n-113, 1 mile west of the discovery, in Uinta County, stopped drilling at 12,950 ft., a new depth record for the Rocky Mountain area, and has set the 7-in. at 12,944 ft. with 3,000 sacks of cement.

Although the horizon in which the wells are bottomed has not been disclosed by the operator, it is generally believed that drilling stopped after penetrating the Dakota sand, the producing horizon in the discovery well. This well, 1 Government, SW NW 8-16n-112w, was bottomed at 12,894 ft. topped the Dakota at 12,543 ft., and set the 6⅝-in. at 12,879 ft. It was tested through perforations and on final test flowed at the indicated rate of 34,385,000 cu. ft. of gas per day through a ⅞-in. choke in the 2½-in. casing with a surface flowing pressure of 1,500 psi., and approximately 215 bbl. of condensate per day. The ground elevation is 6,957 ft. Total depth, sea level datum, is minus 5,937 ft.

Since testing will be through perforations in the casing, and without information as to the tops, a comparison on total depths shows that No. 2 Unit was drilled to —5,697 ft., or 340 ft. higher than the discovery, and No. 3 Unit to —5,856 or 81 ft. higher than No. 1. It is stated that formation tops will be released after testing is completed.

MILTON Roy PUMPS



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The structure, with 49,838 acres in the unit, is situated out in the Green River basin. Drilling program calls for two additional wells, location to be determined after testing the two completions.

Western Colorado wildcat.—R. E. Wear 1 fee, SW SW SW 27-50n-10w. Montrose County, Colorado, is shut down for orders at 1,673 ft. It is reported to have topped the Entrada, upper Jurassic, at 1,448 ft., and to have drilled granite at 1,635 ft. The well is of particular interest due to its location on the east flank of the Uncompahgre plateau in a district where extensive leasing has taken place by major companies on the theory that stratigraphic traps may be found on the flanks of the uplift. The objective of the well was the Weber at around 3,000 ft. It may be drilled deeper following analysis of samples, the operator contending that the bottom hole formation is hard quartzite, of which 55 ft. was drilled 20 years ago by the same interests ½ mile to the north, going back into a soft formation and encountering a good show of oil.

San Juan Basin test.—Paul B. English-Byrd-Frost, Inc. 1 Government, NW SW 4-27n-10w, Kutz Canyon district, San Juan County, New Mexico, about which there has been a wide divergence of opinion, has been deepened from 6,721 ft., where it was reported to be 45 ft. in the Dakota sand, with good shows of oil and no water, to 6,735 ft. It is reported bottomed in dry Morrison sand showing a little water. Top of the sand was at 6,729 ft. Only 2 ft. of shale was reported to have been drilled before entering the Morrison. Electric survey will be run before determining whether it will plug back, shoot and test the showings in the upper horizons, or drill deeper. In a drill-stem test at 6,450-6,694 ft., open 4 hours, there was a recovery of 2,700 ft. of oil and gas-cut mud.

Worland Dome test.—Pure Oil Co. 5 Unit, C SW NW 21-48n-92w, Worland Dome, Washakie County, Wyoming, a mile southeast of 3 Unit, the nearest and best producer of the three producers, is bottomed at 7,476 ft., and testing shows in the Frontier.

Dry hole at Rangely.—Delta Drilling Co.-Mountain States Petroleum Co. 1 Kennedy, SW NW SW 34-2n-101w, 3 miles east of the nearest producer in the Rangely field, was abandoned at 6,764 ft., approximately 20 ft. in the Weber sand. It was drilled on the theory that faulting might have formed a trap, but apparently the faults did not go to any great depth. The top of the Weber was found at approximately 1,400 ft. below sea level, or 300 ft. deeper than the point at which most wells stop.

New operations.—Eighteen new operations were reported, of which 3 were in Colorado, 4 in Wyoming, and 11 in Montana. Two of the Colorado locations were in the Rangely field and one was a wildcat in Montezuma County. This is Anderson Oil Co. (Mac. T. Anderson) 1 State, C NW SW 36-36n-14w, Mancos District. It is 2 to 3 miles east of the Point Lookout gas field which has some low-pressure gas wells at 700 to 800 ft. in the Dakota (?) sand.

COLORADO WILDCAT FAILURE

Rangely, Rio Blanco County: Delta Drilling Co.-Mountain States Petroleum Co. 1 Kenney, SW NW SW 34-2n-101w, TD 6,746 ft., dry, top Weber approx. 6,717 ft., elev. 5,320 ft.

MONTANA WILDCAT FAILURE

Winifred District, Fergus County: Ideal Oil & Gas Co. 1 Government, SE SE SW 12-22n-16e, TD 3,090 ft., dry in Madison.

TEXAS GULF COAST

Karnes County Gets New Condensate Pool

HOUSTON.—A new gas-condensate pool for Karnes County has been opened by W. E. Kinnear 1 E. Dittmer, approximately 3 miles southeast of Runge and 1½ miles east-northeast of the Runge field, in Karnes County. It was first drilled to a depth of 7,119 ft. and reported abandoned, but later deepened to 8,180 ft. The 5½-in. casing was set to 7,006 ft. for completion. On initial test it flowed 1,027,000 cu. ft. gas and 48 bbl. of condensate per day through a 5/32-in. choke, with gas-condensate ratio of 21,400 cu. ft. Production is through perforations in the Luling sand of the Wilcox zone at 6,764-69 ft.

A new oil pool for San Jacinto County, 4 miles south of Evergreen, has been opened by Mac Drilling Co. 1 Cynthia Payne, in Vital Flores Survey. Drilled to a total depth of 8,260 ft., this well was completed for a Railroad Commission potential of 76 bbl. of oil per day through a ¼-in. choke, gas-oil ratio 650 cu. ft., with tubing pressure 100-210 psi., and gravity of 36.8°. Production is through perforations at 7,682-7,702 ft. The 5½-in. casing is cemented at 7,894 ft.

Amerada Petroleum Corp. 1 Alexander Unit, discovery well for the new Bloomington field in southeastern Victoria County, has flowed potential gage of 155 bbl. of 23.3°-gravity oil per day through a 5/32-in. choke, gas-oil ratio 340 cu. ft., tubing pressure 650 psi., and casing sealed. Production is through perforations at 4,904-09 ft., with total depth 6,921 ft. and 5½-in. casing set at 4,993 ft. This discovery is located on Lot 4, Block 1, Reiss 1st addition to town of Bloomington, approximately 1 mile northwest of Heyser field and 1½ miles northeast of North McFaddin field.

Stanolind Oil & Gas Co. has opened a new producing area south of the Lucky field approximately 2 miles, in Matagorda County. The Marcus D. Huebner, in Peter Bertrand Survey, gaged 28 bbl. of pipe-

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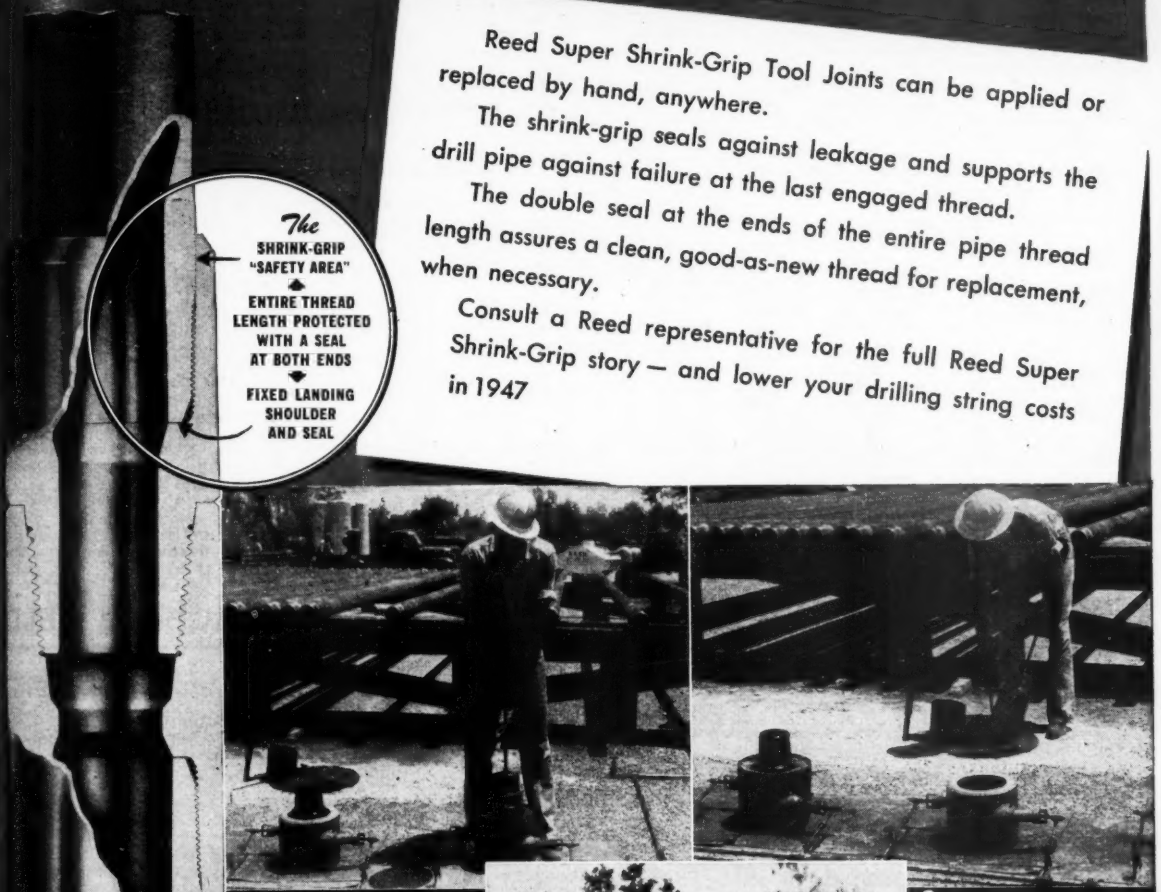

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line oil through a ¼-in. choke on a 10½-hour flow test through perforations at 9,236-38 ft. Flowing pressure on the tubing was 1,775 psi. and 700 psi. on the casing with a gas-oil ratio of 31,000 cu. ft. Total depth is 12,776 ft., and 7-in. casing is cemented to 9,496 ft.

At Cedar Point out in Galveston Bay, Salt Dome Oil Corp. and Standard Oil Co. of Texas 2-94 State reports a potential gage of 116 bbl. of 36.7°-gravity oil daily through a ⅛-in. choke with 900 psi. pressure on tubing. Plugged back total depth 6,040 ft., with top of pay sands at 6,018 ft.

There were 26 new locations this week with 1 being a wildcat in San Jacinto County. The 29 completions included 5 successful exploratory tests and 3 dry wildcats, 1 each in Bee, Chambers and Wharton counties.

TEXAS GULF COAST SUCCESSFUL WILDCATS

Bee County: New oil discovery, Dirks-Wilcox field—Dirks Bros. and Tide Water Associated Oil Co. 1-B Page Estate, in J. W. McFarland Sur., on northwest flank of Dirks field, top pay 7,429 ft. (Mackhank sand), TD 7,438 ft., perf 7,426-35 ft., IP: 139 bbl. oil per day through a 9/64-in. choke, gas-oil ratio 1,218 cu. ft., TP 800 psi., casing sealed, gravity 36.8°, no water.

Brazoria County: New gas-condensate pay, Scoby Lake discovery area—McCarthy Oil & Gas Corp. 1 T. A. Munson, in C. Smith League, 1½ mi. S of Blue Lake production on east side, 5,400 ft. NW of Mary B. Nickell discovery well, TD 11,877 ft., top sand 10,488 ft., perf. 10,488-504 ft., IP: 4,620,000 cu. ft. gas per day and 44 bbl. condensate per day, gas-condensate ratio 105,000 cu. ft. through 9/32-in. choke, TP 2,590 lb., SIP 3,400 lb., gravity 50.2°, no water. Open flow calculation 21,500,000 cu. ft. gas per day.

Karnes County: New condensate discovery—W. E. Kinnear 1 E. Dittmer, in Brooks & Burleson Sur. 1, 3 mi. SE of Runge and 1½ mi. E-NE of Runge field, old well drilled deeper, originally abandoned 3-21-47 at old TD 7,119 ft., deepened to 8,180 ft. and completed through perforations in Luling sand at 6,764-69 ft., IP: 1,027,000 cu. ft. gas per day and 48 bbl. condensate per day through 5/32-in. choke, gas-condensate ratio 21,400 cu. ft., TP 2,300 psi., SIP 2,750 psi., gravity 59°, no water.

San Jacinto County: New oil pool—Mac Drilling Co. 1 Cynthia Payne, in Vital Flores Sur., 5 mi. SW of Cold Spring production, 4 mi. S of Evergreen townsite, TD 8,260 ft., top sand 7,682 ft., perf. 7,682-7,702 ft., IP: 76 bbl. per day through ¼-in. choke, gas-oil ratio 650 cu. ft., TP 100-210 psi., gravity 36.8°, 30 per cent water.

Victoria County: New oil pool, Bloomington field—Amerada Pet. Corp. 1 Alexander unit, Lot 4, Blk. 1 of Reiss 1st addn. to town of Bloomington, 1 mi. NW of Heyser field, 1½ mi. NE of North McFaddin field, top pay 6,904 ft., TD 6,921 ft., perf. 4,904-09 ft., IP: 155 bbl. oil per day through a 5/32-in. choke, gas-oil ratio 340 cu. ft., TP 650 psi., casing sealed, gravity 23.3°, no water.

TEXAS GULF COAST WILDCAT FAILURES

Bee County: W. Earl Rowe et al 1 J. V. Ellis estate, Washington Stephens Sur., 3½ mi. S of Berclair, dry, TD 4,210 ft.

Chambers County: Standard of Texas 2-80 State-Galveston Bay, in Smith Point-Mayes area, Sec. 80, Galveston Bay, approximately 1 mi. W of Mayes field production, dry, TD 8,344 ft. Salt water in Frio 8,204-25 ft., sand 8,308-44 ft.

Wharton County: Oil Drilling, Inc. 1 Charles D. Putnam, in WC RR Sur., Sec. 48, 4 mi. NW of Grubb & Hawkins' Gobbler Creek discovery, dry, TD 5,209 ft.

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APPALACHIAN FIELD

Logan County Has 30-Bbl. Oil Show in Big Lime

PITTSBURGH.—In Logan district, Logan County, West Virginia, Columbian Carbon Co. is drilling through the Big Lime in No. 939 Island Creek Coal Co. and at 2,283 ft. or 167 ft. in that member, there is a showing of 30 bbl. of oil a day. This is the third well on that tract to produce a commercial quantity of oil, but so far no long-lived production has been found.

In Williamsburg district, Greenbrier County, the rotary test of Texas Co. on G. R. Dean farm is drilling at 7,542 ft., or 970 ft. below the base of the Oriskany sand and 84 ft. below the Newburg horizon. In Greenbrier district, Summers County, Godfrey L. Cabot, Inc., shut down for a line change at 5,275 ft. in the deep test on W. M. Elswick farm. In Wolf Creek district, Monroe County, this operator is spudding in the test on Margaret S. Twohig tract.

In Ripley district, Jackson County, Godfrey L. Cabot, Inc., has only a small gas well in the Oriskany sand in No. 1,223 J. L. McLeans Heirs. Here, this operator has topped the Corniferous lime in No. 1,234 T. D. Castro.

In Elk district, Kanawha County, E. C. Metzner's C. P. and B. L. Bryant, which gaged 1,465,000 cu. ft. gas after shooting the Oriskany sand, total depth 5,192 ft. The same operator completed a small gas well in the Neeley Heirs test in the same formation which gaged 145,000 cu. ft. gas after shot, total depth 5,268 ft. Here, Glen Dearth topped the Corniferous Lime at 4,860 ft. in the R. F. Matheney test, elevation 882 ft.

New locations for the week totaled 16, in Fayette, Gilmer, Marion, Pleasants, Putnam, Ritchie, Upshur, Wayne, and Wyoming counties.

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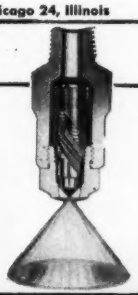

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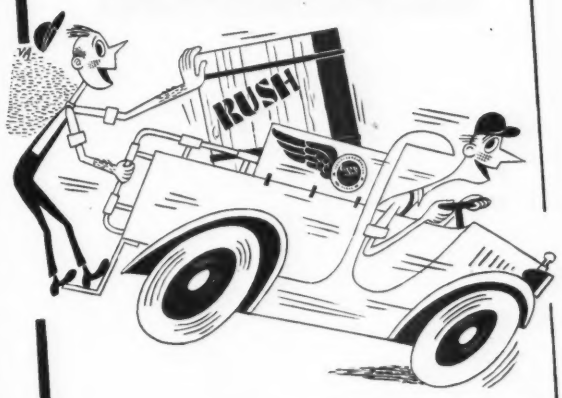

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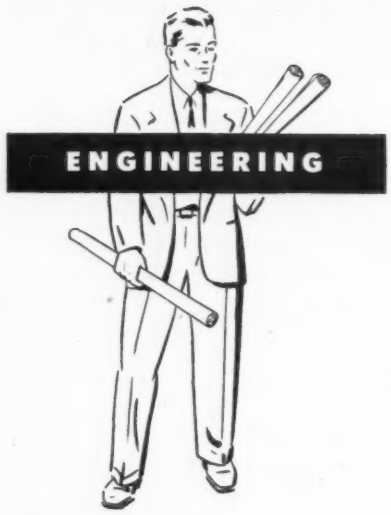

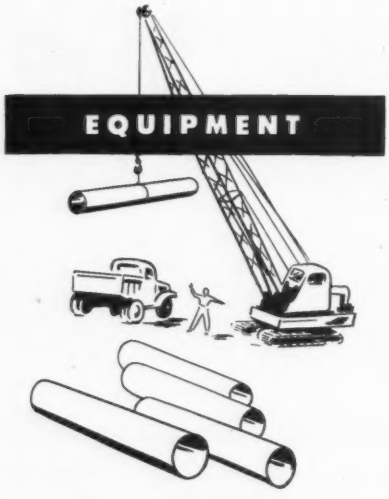

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Fayette County, Peoples Natural Gas Co. topped the Oriskany sand in No. 1 Hartman, the south offset to the large gas well on the Smith farm at 7,533 ft., or −5,179 ft. No gas has been struck to the present depth, whereas in the Smith well the great volume was struck 1 ft. in the chert. To the north, this company drilled through the Oriskany sand to the Helderberg in No. 2 Walters with the Oriskany extending from 7,645 ft. to 7,710 ft. or 5,191 to 5,256 ft. Only one small showing of gas was struck in the chert. Here, Manufacturers Light & Heat Co. recovered the tools and are fishing the bit in the north offset No. 1 Jesse Eutsey. With the jars and stem out of the hole, the gas struck at the present depth increased from 650,000 cu. ft. to 750,000 cu. ft.

New locations totaled 7 and in Madison, Mahoning, Plum Creek and Sugar Creek townships, Armstrong County; Fallowfield and North Strabane townships, Washington County; Hempfield Township, Westmoreland County.

EASTERN TEXAS

San Augustine County Has Good Prospect

DALLAS.—M. E. Davie et al 1 W. A. Johnson, 3¾ miles north of the town of San Augustine, San Augustine County, was showing for a commercial producer last week when a drill-stem test at 8,140-70 ft. recovered 720 ft. of 40°-gravity oil in 1 hour. Maximum surface pressure was 80 psi., with a flowing bottom-hole pressure of 3,300 psi. Operators were coring ahead at 8,187 ft. in lime and shale to determine the extent of the pay zone. Pettit porosity was reported at 8,145-55 ft. A previous test at 7,588-7,612 ft. recovered the water cushion plus 685 ft. of salt water.

In Houston County, 6 miles southeast of Grapeland, Magnolia Petroleum Co. 1 J. W. Grounds was shut down at 10,436 ft., with prospects for a producer poor. No shows were reported from a series of side-wall cores in the Rodessa zone above 10,436 ft., and operators were waiting on orders to deepen or abandon the test. The Massive anhydrite was placed at 10,000-110 ft.

In Freestone County, 3 miles west of Fairfield, The Texas Co. 1 W. M. White had total depth at 14,331 ft. in limestone, then plugged back to 11,417 ft. Liner was run from 8,076-11,417 ft. Perforations were made and squeezed, with no report of a test, in the Cotton Valley at 11,312-314 ft. New perforations were placed at 11,292-306 ft. and operators were preparing to test a gas show found when drilling at that depth.

Humble Oil & Refining Co.'s extension test north of Woodbine production at Hawkins, in Wood County, was last reported drilling below 13,123 ft. in shale and limestone. In Kaufman County, 2 miles north and east of Kemp, Humble 1 H. L. Guy was below 7,277 ft. in sand and shale of undetermined origin.

In Anderson County, a third producer marked a ¾-mile west extension from the discovery of the Elkhart-Hemby gas field, as Bluebird Investment Co. 1 Sutton & Jackson, in the Box Survey, set casing on bottom at 5,565 ft. for a test. Electric survey had indicated gas sand in the Woodbine at 5,495-520 ft.

EAST TEXAS SUCCESSFUL WILDCATS

Cherokee County: Standard Oil Co. of Texas 1 New Birmingham Development Co., G. E. Looney Sur., 2½ mi. NW of Maydell, flowed 6,150,000 cu. ft. gas per day and 31.7 bbl. of oil through ⅛-in. choke, tubing pressure 3,200 lb., calculated open flow potential 147,000,000 cu. ft., pay in Bacon limestone 8,608-30 and 8,638-52 ft., TD 10,017 ft., PB 8,656 ft.

Leon County: United North & South Development Co. 1 R. L. Oden, W. Martin Sur. 7, 2 mi. S of Flynn, pumped 10 bbl. 35°-gravity oil in 24 hr., Woodbine 6,900-7,356 ft., by samples, perforated 7,195-7,235 ft., flowed approximately 20 bbl. clean oil a day by heads, perforated 7,055-64 ft. and 7,157-65 ft., TD 8,112 ft., elev. 549 ft.

EAST TEXAS WILDCAT FAILURES

Rusk County: Tex Harvey Oil Co. 2 S. N. Coleman, Mary Ale Sur., 12 mi. NE of Rusk, dry, TD 4,363 ft., sample tops: Navarro 2,922-52 ft., Pecan 3,300-10 ft., Woodbine 4,250 ft., elev. 342 ft.

Wood County: R. J. Caraway et al 1 Mullinax & Martin, Mary Polk Sur., 10 mi. NW of Hawkins field, dry, TD 8,063 ft., Pecan 3,080 ft., Austin 4,605 ft., Woodbine 5,310 ft., Georgetown 6,150 ft., elev. 470 ft.

Humble Oil & Refining Co. 1 Little Sandy Hunting & Fishing Club, deep test on SW flank of Hawkins field, dry, TD 9,512 ft. in Travis Peak, sample tops: Woodbine 4,736 ft., Paluxy 6,712 ft., Glenrose 7,140 ft., Massive 8,575 ft., Rodessa 8,635 ft.

LA.-ARK.

Smackover Strike North of Magnolia

EL DORADO.—Placid Oil Co. last week was running pipe and building storage tanks at its 1 Farmers Bank & Trust Co., 1-17s-20w, Columbia County, north of the Magnolia field, after making a successful drill-stem test at 7,433-38 ft. in the Smackover. Recovery, in 20 minutes through ¼-in. chokes, was 30 ft. of 58.9°-gravity distillate, under surface pressure of 600 psi.,

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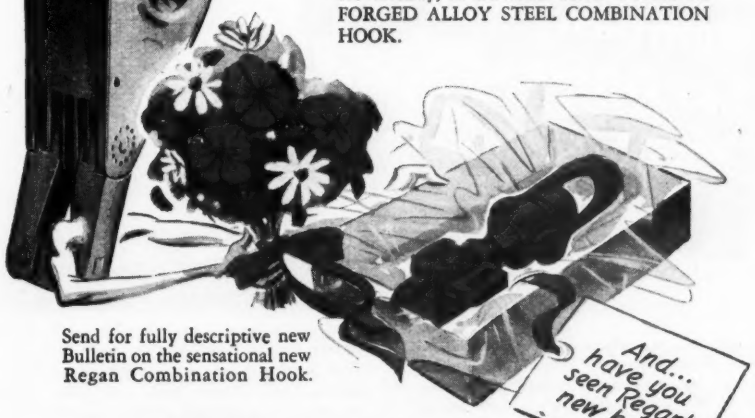

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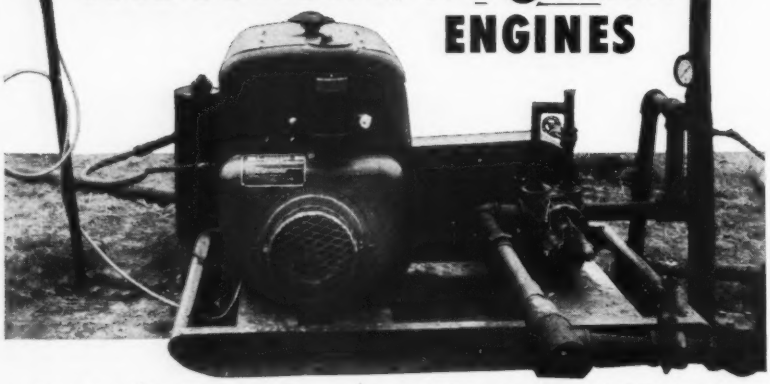

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and a bottom-hole flowing pressure of 2,025 psi. Total depth was 7,436 ft., still in the Smackover, which was topped at 7,402 ft. Top of porosity was 7,418 ft. Previous drill-stem tests at 7,414-33 ft., open 15 minutes, produced little surface pressure and recovered only 6 ft. of mud cut with gas. Operators then cored at 7,433-38 ft., recovering 5 ft. of porous limestone, having good distillate gas odor. Production tests will be made when casing is set and tanks are completed.

In Drew County, Curtis Kinard 1 A. S. Reinhart, NW SE SW 15-12s-6w, was drilling below 4,100 ft., toward its goal of 4,500 ft. in the Nacatoch. In Lafayette County, McAlester Fuel Co.'s 1-A Texas Co.-Lee, 24-17s-24w, was drilling below 7,338 ft. Arrow Drilling Co. 2-A Union Saw Mill, NW SE 8-18s-12w, Union County, 3½ miles west of the New London field, had total depth at 2,759 ft. Operators stopped to run electric survey when cores at 2,562-84 ft. showed sand with a show of oil. Scheduled depth is 3,500 ft.

NORTH LOUISIANA WILDCAT FAILURE

De Soto Parish: Triangle Drilling Co. 1 Long, SE SW NW 16-14n-14w, dry, TD 4,286 ft., Nacatoch 1,348 ft., Base Austin 2,867 ft., sand 3,368 ft., elevation 249 ft.

ARKANSAS WILDCAT FAILURES

Little River County: Mike Carlton 1 W. H. Atkinson, NE SW 11-12s-32w, dry, TD 28,970 ft. Massive anhydrite 2,095-2,160 ft., Paluxy, by sample, 2,967 ft., elevation 417 ft.

Nevada County: Charles F. Steele 1 T. W. Works, E½ NE SE 9-15s-22w, dry, TD 1,190 ft.

KANSAS

Renewal Operation Fills 2,000 Ft. with Oil, 2 Hrs.

HARBAR DRILLING CO. 1 Baldwin, NE SE 9-10s-19w, Rooks County, 1½ miles west of the Vohs pool, after swabbing for 1 hour, filled up 550 ft. with oil in 1 hour, 2,000 ft. in 2 hours, and filled to top overnight, from perforations in the Lansing at 3,446-50 ft. Lansing was topped at 3,410 ft. This is a renewal operation, as the well was originally drilled into the Arbuckle, and 5-in. pipe was set on top of the Arbuckle at 3,727 ft.

Skelly Oil Co. 1 Hamlin, SW NE NW 10-33s-12w, Barber County, 2 miles northeast of the Boggs pool, which was reported 7 ft. higher on top of the Simpson than the highest well in the Boggs pool, swabbed 15 bbl. water per hour with trace of free oil from the top of the Simpson sand, and will be deepened to the Arbuckle.

KANSAS SUCCESSFUL WILDCATS

Pawnee County: Huber, Goodpasture & Harbar 1 Torrance, SW SW SW 19-21s-15w, gaged 34-40,000,000 cu. ft. gas from Heebner at 3,847-57 ft.; Lansing-Kansas City 3,466 ft., Sooy 3,751 ft., Simpson 3,807 ft., Arbuckle 3,846 ft., TD 3,857 ft.

Stafford County: J. H. Huber Corp. 1 O'Connor, C NW NW 16-24s-15w, gaged 26,000,000 cu. ft. gas from Arbuckle at 4,063-73 ft.; brown lime 3,647 ft., Lansing-Kansas City 3,654 ft., Viola 3,998 ft., Simpson 4,027 ft., TD 4,073 ft.

KANSAS WILDCAT FAILURES

Butler County: E. H. Adair 1 Morrison, SE SW SW 24-28s-6e, dry, TD 2,811 ft., Lansing 1,790 ft., Kansas City 2,115 ft., Mississippi lime 2,789 ft.

Kingman County: Globe Oil et al 1 Cirkel, C NW NE 30-29s-10w, dry, TD 4,760 ft., Lansing-Kansas City 3,746 ft., Mississippian 4,284 ft., Viola 4,554 ft., Simpson 4,624 ft., Arbuckle 4,725 ft.

Rice County: Anderson-Prichard and Texon 1 Rolf, NW NW NW 6-18s-9w, dry, TD 3,270 ft., Lansing-Kansas City 2,870 ft., conglomerate 3,214 ft., Arbuckle 3,236 ft.

Rooks County: Bridgeport Oil and Phillips Petroleum 1 Meade "A," SE SE SW 35-8s-20w, dry, TD 3,678 ft., Heebner 3,286 ft., Lansing 3,303 ft., Kansas City 3,545 ft., conglomerate 3,589 ft., Arbuckle 3,650 ft.

Sunray Oil Co. 1 Desmarteau, SW SW SW 29-9s-19w, dry, TD 3,678 ft., Topeka 3,139 ft., Heebner 3,347 ft., Lansing-Kansas City 3,387 ft., Basal Kansas City 3,598 ft., conglomerate 3,627 ft., Arbuckle 3,630 ft.

Stafford County: Virginia Drilling Co. 1 Laudick, NW NW SE 10-21s-12w, dry, TD 3,552 ft., Heebner 3,070 ft., brown lime 3,209 ft., Lansing-Kansas City 3,227 ft., Basal Kansas City 3,442 ft., cherty Viola 3,446 ft., Simpson shale 3,455 ft., Arbuckle 3,501 ft.

PERMIAN BASIN

Strawn Area in Coke County Looking Good

MIDLAND.—The significance of Sun Oil Co.'s recent Strawn discovery in northwestern Coke County became more pronounced last week at the completion of the third and fourth producers in the field. The third well, 1 Homer H. Jameson, a ¼-mile west offset to the discovery, made a 24-hour flow of 196.47 bbl. of 46.7°-gravity oil, cutting only 0.04 per cent acid water, on a Railroad Commission test. Production was through ¼-in. choke on tubing set at 6,445 ft., and from perforations in 4 zones between 6,200-6,458 ft. Flowing tubing pressure was 650 psi., and casing pressure was 1,380 psi. The well had been treated with 5,000 gal. of acid. Gas-oil ratio was 1,369 cu. ft.

The 2 Fred Jameson, indicated fourth producer for the field, found the pay zone starting at 6,302 ft., some 132 ft. lower than the discovery, 2,944 ft. to the northwest, but recovered clean oil on two drill-stem tests. The first test of the Strawn section at 6,265-6,315 ft. produced a fair blow of air, with gas showing at the surface in 17 minutes. Recovery was 180 ft. of clean oil and 270 ft. of oil and gas-cut drilling mud. It was drilled ahead to 6,365 ft., then tested for 50 minutes with packer set at 6,315 ft. Flowing through ⅝-in. bottom choke and ¼-in. top opening, gas came to the surface in 6 minutes, with oil starting to flow at the end of 45 minutes. Gas was estimated at the rate of 365,000 cu. ft. a day. Oil was allowed to flow for 5 minutes before the tool was closed, but the flow was not gaged. When the drill pipe was broken down, it yielded 480 ft. of clean oil. Bottom-hole flowing pressure was 1,050 psi., which increased to 2,750 psi., when shut in.

Operators then drilled ahead to 6,415 ft., where a 60-minute drill-stem test from 6,365-6,415 ft. recovered 30 ft. of clean oil and 270 ft. of oil and gas-cut mud. Completion tests were to be made when casing is set on bottom. This tests marks the longest extension yet made, being slightly over ½ mile south-southeast of the discovery. The section in this well, from 6,300-65 ft., was said to be the softest zone of that much thickness so far found in any well in the field. Drilling time had averaged 5 minutes to the foot.

In north central Crane County, Gulf Oil Corp.'s 1 HH University, also considered a major discovery, flowed 277 bbl. of oil in 5½ hours on a drill-stem test at 10,947-988 ft., with an indicated pay zone totaling some 400 ft. in the Ellenburger.

WEST TEXAS WILDCAT FAILURES

Ector County: Phillips Petroleum Co. 1 Millard-Edison, Sec. 2, Blk. 8-15, PSL Sur., 4 mi. S of TXL field, dry, TD 11,000 ft., Yates 2,630 ft., San Andres 4,080 ft., Clear Fork 5,410 ft., Mississippi 8,130 ft., Woodford shale 8,420 ft., Devonian 8,643 ft., Silurian 9,330 ft., Simpson 9,920 ft., Ellenburger 10,837 ft., elev. 3,038 ft.

Gaines County: Jergins Oil Co. 1 Parmer Co., Parmer CSL Sur., 4½ mi. E of Florey, dry, TD 5,504 ft., anhydrite 2,147 ft.

Howard County: Duncan Drilling Co. 1 L. M. Newton, Sec. 5, Blk. 33, T.&P. Sur., 8 mi. NW of Big Spring, dry, TD 3,168 ft., Grayburg 2,960 ft., San Andres 3,050 ft., elev. 2,561 ft.

Mitchell County: Standard Oil Co. of Texas 1 J. C. Womack et al, Sec. 5, Blk. 28, T&P Sur., 2 mi. W of northern end of Westbrook field, dry, TD 3,085 ft., show free oil 2,640-53 ft., bailed 16 gal. oil and 40 gal. salt water in 8 hr., top limestone 1,675 ft.

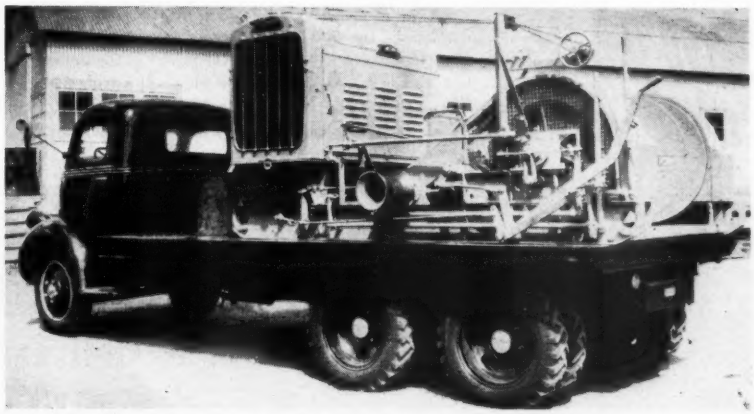
Yoakum County: The Texas Co. 1 J. H. Samuels, Sec. 242, Blk. D, J. H. Gibson Sur., 11 mi. NW of Plains, dry, TD 5,355 ft., San Andres 4,510 ft., anhydrite 2,375 ft., elev. 3,804 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—In Eddy County, 7 miles north of Artesia, Mesa Retailers, Inc. 1 Blind Snake, in 2-16s-25e, was reported to have found some showings of oil in the Glorietta, topped at 1,718 ft., and operators were to set casing for production tests. Total depth was 1,900 ft. Scheduled depth for the rotary test is 6,000 ft.

Southeast of the Artesia field in Eddy County, N. W. Jones 1 Jones Estate, 12-19s-27e, had a slight show of oil at 1,588-1,604 ft. in sand, and again at 2,700 ft. Operators plugged back to 1,700 ft., from total depth of 3,043 ft. and shot between 1,690-1,700 ft. but recovered only water.

In Lea County, Barnsdall Oil Co. 1 Elliott-Federal, 20-21s-37e, a 6,700-ft. rotary outpost to the Drinkard area, set 9-in. casing to 2,850 ft. in limestone and anhydrite, and was waiting on cement. In southeastern Lea County, 13 miles north of the town of Ochoa, Allen Hargrove 1



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State, 1-23s-34e, was drilling below 3,915 ft. in limestone, after an electric survey indicated no shows of oil to 3,735 ft. Five miles southeast of the Vacuum field, McElvain Brothers 1 Seale, 30-18s-34e, scheduled 9,400-ft. rotary test, had total depth at 4,900 ft. Peforations in casing at 3,838 ft. swabbed 1,000 ft. of water, plus 250 ft. of oil in 6 hours. Operators shut down for orders.

MISSISSIPPI

Jones County Test Cores Good Shows

JACKSON.—Additional shows of heavy black oil have been found in cores at Gulf Oil Corp. 1 Major, Jones County test in 29-6n-11w. The hole was cored steadily from 11,612 ft. to total depth of 11,706 ft., where operators stopped to ream the hole. The additional shows were reported in cores from 11,612-82 ft., cores from that depth to bottom having no shows.

MISSISSIPPI WILDCAT FAILURES

Forrest County: Superior Oil Co. 1 Maria Draughn, NE SE NE 12-3n-13w, dry, TD 12,141 ft., twisted off drill stem, stuck washover pipe at 10,281 ft., PB 9,700 ft., no tops reported.

Issaquena County: C. H. Murphy, Jr., and Sun Oil Co. 1 M. T. Reed, NW NE SW 27-10n-8w, dry, TD 4,096 ft., Wilcox 2,054 ft., Midway 3,267 ft., Gas Rock 3,720-28 ft., Tuscaloosa 3,728 ft., Paluxy 3,840 ft., elev. 104 ft.

Wayne County: S. P. Borden 1 W. A. Robinson, SE NW 26-7n-7w, dry, TD 7,510 ft., Tuscaloosa 6,146 ft., Marine Tuscaloosa 6,890 ft., Massive sand 7,242 ft., elev. 207 ft.

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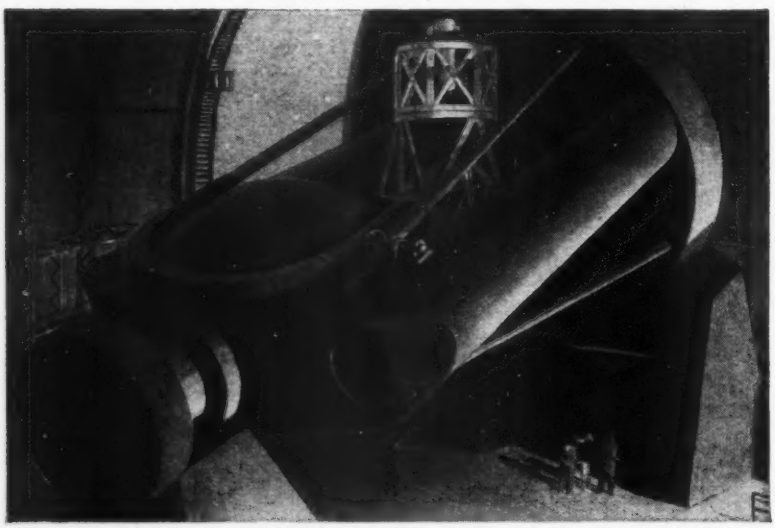

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CALIFORNIA

Extension to Cymric Indicated by Test

LOS ANGELES.—An eastern extension of approximately ½ mile for the Cymric field of Kern County was indicated last week at The Superior Oil Co. 26-23 F. & W., 23-29s-21e. On a 45-minute formation test of the Button Bed zone at 5,275-5,315 ft., the well showed gas at the surface in 20 minutes and recovery included 1,450 ft. of very gassy, slightly muddy, 26.1°-gravity oil, 360 ft. of oily, muddy salt water, 250 ft. of gassy, 27.9°-gravity oil and 550 ft. of salt water. Operators are now drilling ahead in shale below 5,451 ft. in an effort to locate deeper and more substantial producing zones.

Seaboard Oil Co.'s Bacon Hills discovery well, the 3-21 Seaboard-Bandini, 21-28s-20e, Kern County, has been placed on pump and at latest reports was pumping at the rate of 56 bbl. of 40.2°-gravity oil per day. Considering the well's total depth of 8,477 ft., this production is considered far from satisfactory, although many field men are inclined to believe that some of the perforations may be clogged. While no definite decision has been reached, it is reported that the company may go ahead and drill a southeast offset, the 24-21 Seaboard-Bandini, and check its production against the discovery well before further remedial measures at the latter. Rig is already in place for the 24-21 Seaboard-Bandini.

Amapola Oil Corp. at the close of the week was attempting to test showings which it reported were encountered at a depth of 840-900 ft. in its wildcat in the Lancaster area of Los Angeles County. The well, Amapola No. 1, 6-6n-12w, is far removed from any production and is about 2 miles northwest of a test drilled some time ago to a depth of 1,867 ft. Several tests have been drilled in the surrounding area, but no production has been developed so far. It is reported that operators are experiencing difficulty in setting a formation tester at a depth of 800 ft. in the present test. The difficulty is supposedly due to the failure of a plug at 900 ft. to hold its position as a shelf for the tester. Total depth is 1,750 ft.

Among several interesting wildcats staked during the past week was Richfield Oil Corp. A-1 K.C.L., 20-11n-20w. This wildcat is northwest of the Wheeler Ridge field in an area which Richfield drilled a test several years ago without production success. The original test encountered good oil showings, but these were nullified by water which could not be shut off.

Barnsdall Oil Co. has staked location and is moving in equipment for the 1 Capron-Menvig, 17-6s-10w, a wildcat test to be drilled on the hogback north of the West Newport field. The venture is situated north of the Macco Corp.'s recent completions on the hogback and about ½ mile north of the original producing area of the field. This will be Barnsdall's first try in the area.

General Petroleum Corp. last week continued drilling at its Paloma field extension well, the 18-36 Tupman, 36-31s-20e, in the northeast corner of the field. At the close of the week the company reported the well going ahead in hard shale at 12,186 ft. During the previous week, this well flowed at the rate of 631 bbl. of 28.9°-gravity crude daily through a 24/64-in. choke on a formation test of a 105-ft. sand body encountered at 11,920 ft. Operators, however, decided to drill ahead in an effort to increase the sand body already encountered.

CALIFORNIA WILDCAT FAILURES

Fresno County, San Joaquin Area: Superior Oil Co. 75 Hackala, 32-15s-17e, dry, elev. 191 ft., Kreyenhagen 6,640 ft., 1st Basal Kreyenhagen sand 7,028 ft., Wheatville 7,206 ft., TD 7,242 ft.

Kern County, Jasmine Area: Pacific Oil &

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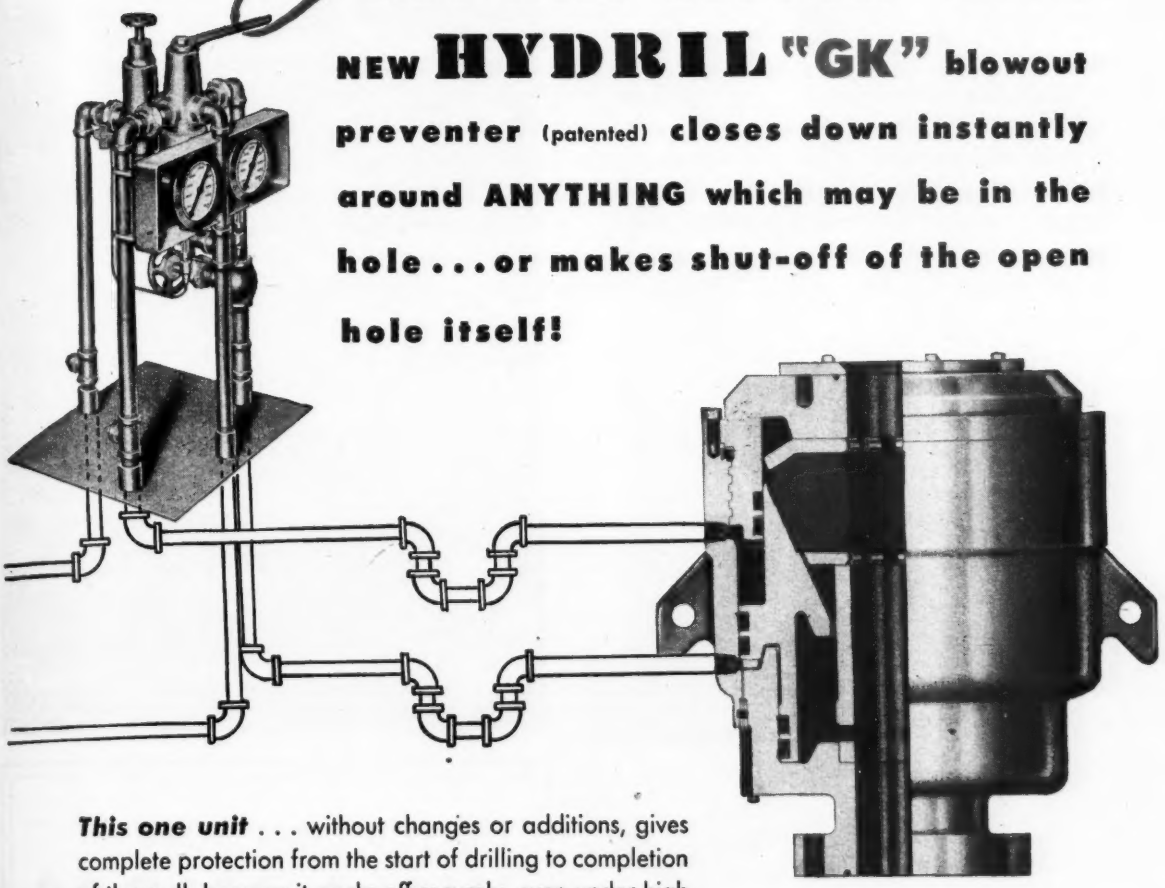

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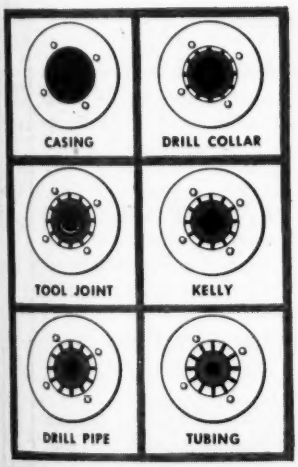

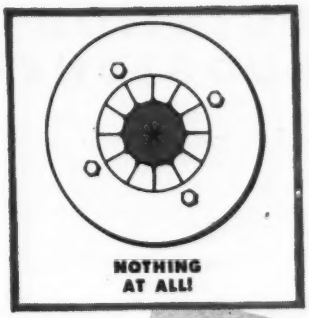

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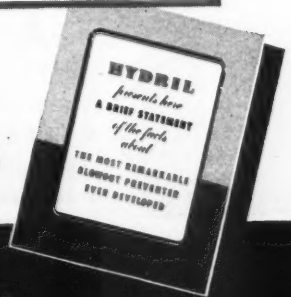

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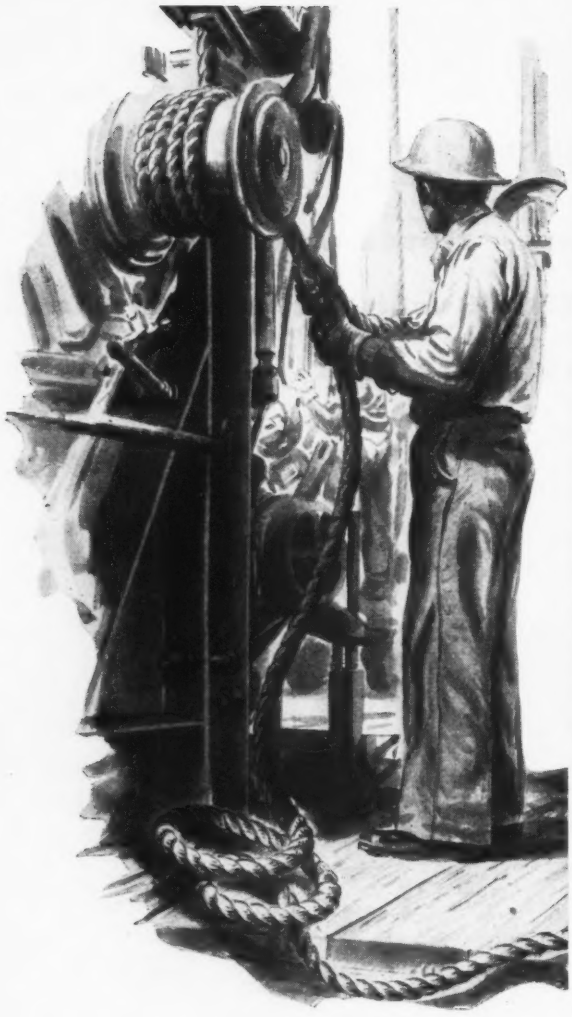

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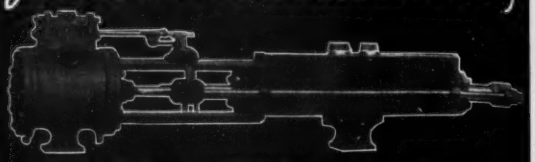

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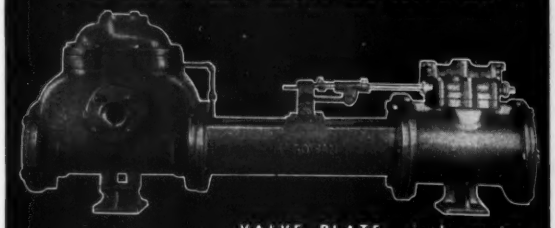

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THE OIL AND GAS JOURNAL

P. O. Box 1260 **Tulsa, Oklahoma**

Gas Development Corp. 85-22 C. C. M. O., 22-25s-27e, dry, elev. 727 ft., TD 2,968 ft.

Round Mountain Area: Union Oil Co. 64-21 Olcese, 21-28s-29e, dry, elev. 1,034 ft., base Olcese 1,102 ft., Vedder 1,918 ft., TD 2,251 ft.

Los Angeles County, Canoga Park Area: Vincent F. Stabeck 3 Knapp, 4-1n-17w, dry, elev. 1,025 ft., TD 235 ft.

Solano County, Dixon Area: Amerada Petroleum Corp. 1 McGinsey, 5-6n-2e, dry, elev. 43 ft., TD 5,000 ft.

Tulare County, Goshen Area: Superior Oil Co. 18-8 McGee, 8-18s-24e, dry in slate, TD 3,650 ft.

Yolo County, Davis Area: Standard Oil Co. 1 Campbell Comm., 18-8n-2e, dry, elev. 72 ft., TD 5,000 ft.

CANADIAN FIELDS

Leduc Second Well Flows Although 200 Ft. Low

CHATHAM.—In the Leduc field, southwest of Edmonton, Imperial-Leduc 2, LSD 1, 16-20-26w4, 1½ miles southwest of the discovery well and down flank from it, has commercial oil and gas production in the Devonian limestone at 5,368-81 ft. This is 202 ft. below the producing depth in the discovery. Coring halted at 5,381 ft. and on drill-stem test the well began making at the rate of 1,000,000 cu. ft. gas daily. Three minutes after tester was opened, it began to spray oil. After 25 minutes the pipe was pulled and found to hold 300 ft. of gasified 38.8° A.P.I. gravity oil, with no sign of water. After coring another 10 ft. to 5,391 ft. the well began to flow through drill stem to the top.

Imperial-Leduc 1, the discovery, blew in last February with initial flow rated 1,000 bbl., producing from the Devonian limestone at 5,029-66 ft. The corresponding zone in Imperial-Leduc 2 showed oil and gas but with only slight porosity, and coring was continued to the present depth.

Imperial-Leduc 3, LSD 10, 25-50-26w4, located 2 miles northeast of discovery, has shown varying light porosity from 4,925-5,016 ft. A series of drill-stem tests at 10 to 20 ft. intervals have shown small oil cuts in mud recovery, with the latest at 5,006 ft., showing one stand of free oil in addition.

Discovery well is now producing at sharply restricted rate through a ⅛-in. choke, at 90 to 100 bbl. with potential around 300 bbl. Flow is to be stepped up as soon as transportation facilities are available. It may be acidized.

With the results secured at No. 2, operators regard Leduc as the most important Alberta discovery since Turner Valley.

Ontario.—In southwestern Ontario, a test drilled for Imperial Oil on the Johnson farm in the Kerwood area, Lambton County, is reported to have struck oil at 357 ft. with 40-bbl. initial production. An additional 10 wells will be drilled in the area south and west of Watford.

OKLAHOMA

East Lindsay Getting Good Extension Well

R. L. BAUMAN and Max Pray 1 Frankenburg, NW NE 7-4n-3w, Garvin County, ½ mile east of production in the East Lindsay pool, is running 7-in. to 10,064 ft., total depth. Drill-stem at 9,908-75 ft. showed 50 to 60 bbl. distillate per hour and estimated gas flow of 50,000,000 cu. ft. per day. First Bromide was logged at 9,600 ft.

Carter Oil Co. 1 Bradshaw, NW SE 4-4n-3w, 2 miles east and ½ mile north of the Frankenburg well, had top of Pennsylvanian at 7,146 ft. Drill-stem test at 7,150-67 ft. showed 500,000 cu. ft. gas and recovered 120 ft. of oil and gas-cut mud and 40 ft. of 37.5°-gravity oil. Drill stem test at 7,270-95 ft. showed estimated gas volume of 1,200,000 cu. ft. per day and recovered 30 ft. of distillate and 30 ft. of oil and gas-cut mud. Well is now drilling below 8,226 ft.

Mid-Continent Petroleum Corp. 1 Vandiver, SE SW NW 14-2n-2w, Garvin County, the second completion in the Elmore City pool, is flowing 60 bbl. oil per hour through ¾-in. choke from perforations at 6,596-6,616 ft. This is a west 40-acre offset to the discovery well.

Carter Oil Co. 1 Bohanan, NW NE SW 14-2n-2w, a southwest diagonal offset to the discovery well in Elmore City pool, is drilling below 6,515 ft. Drill-stem test at 6,458-6,507 ft., in the Gibson sand pay, showed gas in 8 minutes, and in 22 minutes began flowing 50 to 60 bbl. oil per hour with an estimated gas volume of 2,000,000 cu. ft. per day.

OKLAHOMA SUCCESSFUL WILDCATS

Comanche County: Texola Drilling Co. 1 Tas Saw, SW NE SW 24-4n-11w, flowed 8,400,000 cu. ft. gas from sand at 1,740-61 ft.; sand 740-45 ft., Base Pontotoc-Bromide 1,210 ft., sand 1,315-24 ft. and 1,324-1,440 ft., TD 1,762 ft.

Noble County: Kingwood Oil Co. 1 Bolay, SW SW NW 35-23n-1w, flowed 723 bbl. of oil per day from Bartlesville at 4,487-89 ft., through ¼-in. tubing choke, Pawhuska 2,068 ft. Tonkawa 2,782-2,803 ft., Layton 3,517-3,618 ft., Oswego 4,088 ft., TD 4,489 ft.

OKLAHOMA WILDCAT FAILURES

Cotton County: R. E. Barbre 1 Cassidy, NW NW SE 30-2s-11w, dry, TD 2,006 ft., sand 1,894-1,900 ft.

Snoddy Brothers 1 Keeter, NW NW SE 22-4s-10w, dry, TD 2,005 ft., sand 715-33 ft., 1,273-90 ft., 1,379-90 ft., 1,445-60 ft., 1,502-12 ft., 1,555-85 ft., and 1,610-23 ft., lime 1,628-80 ft., 1,841-49 ft., and 1,857-63 ft.

Gandy et al 1 Johnson, NW NW NW 9-5s-10w, dry, TD 1,896 ft., sand 1,492-95 ft. and 1,715-22 ft.

Garvin County: Lookabaugh et al 1 Dulworth, NE SW SE 36-4n-3e, dry, TD 3,077 ft., sand 1,125-55 ft., sandy lime 1,532-37 ft., sand 1,752-68 ft., Simpson 1,925 ft., sandy lime 2,167 ft.

Jefferson County: R. V. Dillard 1 Kennedy, SE SE NW 31-5s-8w, dry, TD 2,001 ft., sand 1,400-29 ft., 1,539-58 ft. and 1,982-98 ft.

Noble County: Peppers Refining Co. 1 Neely, NE NE SE 28-23n-1w, dry, TD 4,710 ft., Pawhuska 2,095 ft., Oread 2,455 ft., Avant 3,180 ft., Perry gas 3,245 ft., Layton zone 3,565-3,660 ft., Oswego 4,102 ft., Bartlesville 4,483-87 ft., Basal Pennsylvanian-Mississippian 4,650 ft.

Oklahoma County: Ace Gutowsky 1 Hunt, NE NE NW 29-13n-1w, dry, TD 6,448 ft., Pawhuska 2,726 ft., Oread 3,655 ft., Hogshooter 4,714 ft., Checkerboard 4,994 ft., Oswego 5,558 ft., Sylvan 6,043 ft., Viola 6,154 ft., Wilcox 6,312-35 ft., 2nd Wilcox 6,401 ft.

OHIO, KENTUCKY

Operators Have Good Luck In Extending Gas Areas

COLUMBUS.—William Pfeiffer 2 Corundite Refractories, Lot 74, Lawrence Township, Tuscarawas County, made 70,000 cu. ft. in the red Clinton, 4,707-49 ft., and 650,000 cu. ft. natural in the white Clinton, 4,758-75 ft. After shot, the well was shut in at 1,532,000 cu. ft., which should encourage drilling in a large untested area to the southwest.

Two gas wells were struck in Salt Creek Township, Muskingum County, this week. Wasson Co. 1 O. R. Downing, Section 36, reached the Clinton at 4,439 ft. and 4,451 ft. the gas gaged 750,000 cu. ft. which caught fire and burned the rig down. This is a ¾-mile east extension to the south part of the field. In an inside location, Wasson Co. 2 Ora Staker, Section 28, had a gas pay in the Clinton at 4,134-39 ft. which made 1,152,000 cu. ft. natural and 1,500,000 cu. ft. after shot.

While drilling a semiwildcat on J. S. Cliffe, Section 2, Clinton Township, Wayne County, the Ohio Fuel found 620,000 cu. ft. gas in the Newburg, logged at 2,684-2,723 ft. If the well does not show any water it will be acidized after tubing.

McConnell et al 2 Homer Caywood, Section 11, Reading Township, Perry County, filled up with 1,100 ft. oil in 30 hours from the Clinton, 3,083-3,121 ft. After a 90-qt. shot the well made 25 bbl. in 24 hours.

OHIO SUCCESSFUL WILDCATS

Meigs County, Chester Township: Ohio Fuel Gas 1 W. H. Ritchie, Sec. 1, Brown

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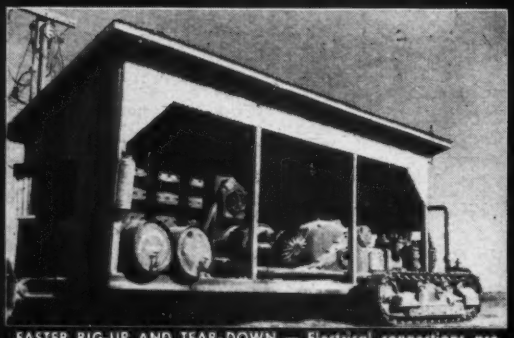

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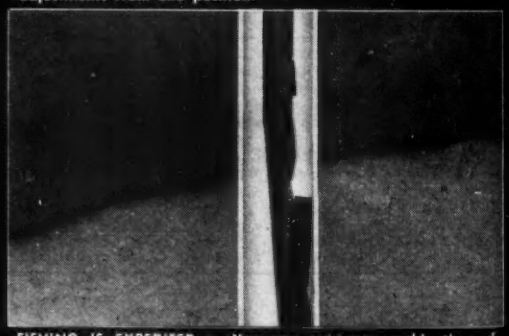

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shale 2,841-3,260 ft., 168,000 cu. ft., TD 3,270 ft.

EASTERN KENTUCKY

ASHLAND.—Deepening of the Kentucky-West Virginia Gas Co.'s Well No. 760 on the Dan J. Syck, Pike County location, was carried to a 327,000 cu. ft. of gas in shale, A. S. Total depth at completion was noted at 3,563 ft., with the original depth at 1,768 ft. One other completion was noted on the Carlisle Lands, Martin County, at 688 ft., where the company completed Well No. 5,738 at 735,000 cu. ft. of gas in salt sand.

Several dry holes were noted during the week, Well No. 844, Robert Williams, Pike County, 3,146 ft.; Well No. 5702, Charles Sturgill, Knott County, 3,250 ft.; Well No. 5,717, Pike County, 3,163 ft.

Chenault et al have moved a drilling machine to a location on the George Ginter farm, Section 12, P65, Madison County, 1 mile east of College Hill. Trenton, St. Peter, and Knox Dolomite formations will be tested.

WESTERN KENTUCKY WILDCAT FAILURE

Henderson County: Carter Oil Co. 1 Mattingly, NE NW NE, 19-P-23, elev. 406 ft., dry at 2,646 ft., Menard 1,624 ft., Viola 1,788 ft., Cypress 2,208 ft., Renault 2,358 ft., McClosky 2,461 ft.

INDIANA

EVANSVILLE.—Van Tuyl et al 1 Highman, SW SE SW 31-5s-13w, Posey County, filled to top and slopped over when plug was drilled out, from Palestine sand 1,966-78 ft. Total depth is 1,980 ft. This test is about 1½ miles from nearest production in the North Springfield pool.

East of the West Princeton pool, S. D. Jarvis has set pipe in 1 Hart-Wright, NW 31-1s-10w, Gibson County, at 883 ft. to test the Princeton sand logged at 883-99 ft. Total depth is 2,123 ft.

INDIANA SUCCESSFUL WILDCAT

Posey County: Farm Bureau et al 1 Highman, SW SE SW 31-5s-13w, 280 bbl. from Palestine 1,960-67 ft., elev. 411 ft., TD 3,039 ft., PB 1,980 ft.

INDIANA WILDCAT FAILURE

Sullivan County: C. W. Dittman-Ormiston et al 1 Campbell, SW SE SE 16-8n-10w, dry at 1,830 ft., elev. 580 ft.

ILLINOIS

Macon County Wildcat Dry in Devonian

MATTOON.—C. G. Davis 1 Clement, NW SW NW 28-17n-3e. a rank wildcat about 5 miles northeast of Decatur, in Macon County, is dry at 2,344 ft. The top of the Devonian was logged at 2,212 ft.

There were five wildcat failures completed the past week, two in Hamilton County, and one each in Coles, Cumberland, and Macon counties.

ILLINOIS WILDCAT FAILURES

Coles County: H. C. Sanders et al 1 Childress, NW SE SE 30-13n-11e, junked hole at 1,450 ft., Pennsylvanian sand 337 ft., Chattanooga 997 ft., Devonian 1,090 ft.

Cumberland County: Joe Reznik 1 Butler, NW SW NE 20-9n-9e, dry at 2,658 ft., Tar Springs 2,026 ft., Cypress 2,278 ft., Renault 2,455 ft., Ste. Genevieve 2,500 ft., McClosky 2,594 ft.

Hamilton County: Sohio Oil Co. 1 Stacke, NW SE NW 12-4s-7e, dry at 3,499 ft., Cypress 3,037 ft., Renault 3,247 ft., Ste. Genevieve 3,354 ft., McClosky 3,425 ft.

W. F. Lacy 1 Woody, SW SW SW 26-6s-7e, dry at 3,300 ft., more or less.

Macon County: C. G. Davis 1 Clement, NW SW NW 28-17n-3e, dry at 2,344 ft., Devonian 2,212 ft.

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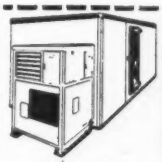
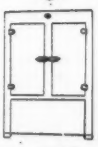

WALK-IN COOLERS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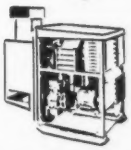
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Imports: A Threat Or a Blessing?

(Continued from page 56)

their charters from the federal Government.

International Trade Organization

A warning that the charter of the proposed International Trade Organization could be very dangerous to all industry unless it contains "some real reservations" was given by Dr. John Lee Coulter, consulting economist, Washington. He reviewed the background of the present reciprocal-trade negotiations and said that "at the present time both domestic and foreign economic programs so far as they relate themselves to the national Government are in a state of chaos or complete confusion."

In a business meeting, the directors approved a resolution authorizing B. A. Hardey, Shreveport, I.P.A.A. president, to appoint a committee to investigate the amount of steel available for oil-equipment production and the effect of equipment exports on the domestic industry. A second resolution asked Congress to exercise the greatest possible government economy, "recognizing that certain activities relating to the petroleum industry are in the public interest and that such activities when found to be essential after careful consideration should be maintained."

Petroleum-Supply Problem Is World Wide

(Continued from page 68)

price of $1.95 a barrel for East Texas 37° A.P.I. and $1.68 a barrel for West Texas 33° A.P.I. gravity crudes, an indication of the price an East Coast refiner could pay at the well for Venezuelan crudes can be obtained by adding transportation to New York to the East and West Texas prices, and working the resulting New York cost back to Venezuela by deducting import duty, transportation, and allowance for quality differential. On this basis, the well-head price an East Coast refiner could afford to pay for important Venezuelan crudes would range from $1.345 a barrel for 14° A.P.I. gravity Bachaquero crude to $1.605 a barrel for 27° A.P.I. gravity medium Lake; $1.725 a barrel for 32° A.P.I. Jusepin crude, and $1.825 a barrel for 37° Oficina crude.

In the Middle East, all of the crudes are characteristically high in sulfur content. The well-head price of Middle East crude to an East Coast refiner, obtained by the same method, is estimated on the assumption that the Middle East crude is of equivalent value to West Texas crude. Based on the present well-head price of $1.68 a barrel, the price of West Texas crude in New York, using W.S.A. tanker rates, is $2.33 per barrel. In working this back to the Middle East by deducting duty and water transportation at W.S.A. tanker rates, the amount an East Coast refiner could afford to pay for Middle East oil at the well-head is estimated at 56.5 cents a barrel. This amount will increase to $1.235 a barrel as soon as the large pipe lines to the Mediterranean and company tankers are placed in service.

I think you will agree that it is not anticipated that any substantial volumes of Middle East oil could find a market now in the United States based on these figures. The gross realization which might be obtained in a United States market would scarcely warrant the large costs and investments, the large royalties, and the risks involved.

World Petroleum Supplies, 1947-1951

It it were possible to produce the world's proved oil reserves at their maximum efficient rates right now, the world's production would be well in excess of requirements. But, during 1946 the world (excluding Russia) produced only 7,479,000 bbl. a day of combined crude oil, casinghead gasoline, synthetics, etc. This rate strained the existing producing facilities throughout the world and barely met the demand. We believe that for the next few years the oil producers world-wide will be able to provide new productive capacity at the rate required to keep up with world demand, but the demand will be great, and it is going to be an uncomfortably close squeeze.

Our estimates (Table 2) indicate that, excluding Russia, total world-wide petroleum supplies of crude, condensate, synthetics, etc., will amount to 7,895,000 bbl. a day this year, increasing at an annual average rate of nearly 400,000 bbl. daily to 9,429,000 bbl. in 1951. But compared with anticipated demands, it seems obvious to us that at least for the next 5 years the world crude situation will be very tight—particularly as compared with the prewar capacity when availability amounted to almost 2,000,000 bbl. a day in excess of world requirements, with 1,000,000 bbl. of this excess in the United States. After 5 years, as more Middle East crude becomes available, the world supply situation should ease up. But even then our forecasts of available production do not exceed requirements by amounts anywhere near the excess before the war.

A number of people have asked that I comment upon the implementation of an import policy. I am glad to do so—but everything I have said so far adds up, in my mind, to only one conclusion: There is no threat to justify such action now, no reason to implement an import policy when that is one of the least of the problems which confronts us today.

In my view, the really important problem facing the independent producers of this country, as well as the major producers and all other branches of the domestic industry, is not the effect of foreign oil developments over the next few years, but whether we here at home are going to be able to meet the critical demands which will be placed on us to supply enough oil products.

Imports Not An Immediate Problem

I do not want to take the position that attention should never be given to the import situation, but I do believe that the figures show convincingly that it will not become a problem for many years. It seems to me that for the time being we can safely rely on the policies and principles which have been stated many times—policies which have been endorsed by your association, the PIWC, the A.P.I., and many others. As John R. Suman, Jersey vice president and director, stated 1½ years ago before a group of Texas producers, the Jersey company fully supports those policies.

Therefore, rather than tackle the complicated problem of regulating imports in relation to the domestic industry, at a time like this when it is a purely academic problem, we should be much better advised to extend our efforts and energy in meeting the far more immediate and pressing problems here at home. I might go further than that and say that I hope we can solve that immediate well enough so that, if imports ever do become a threat, the industry will be still sufficiently healthy and independent to have a voice in what is done. Let me expand further on what I mean.

The major crises in our industry in the recollection of most of us have been an oversupply of crude oil at the source. A great deal of our effort has been directed to solving this problem without getting an unnecessary encroachment of federal control in the price and supply of crude oil. I think the industry and the public have been fortunate in the way crises have been met. But today, the threat of federal control may well be coming in through the back door of meeting consumer demand for products, rather than through the front door of overproduction.

Production Cut Ordered

AUSTIN.—The Texas Railroad Commission last week cut back production in Keystone Ellenburger field, Winkler County, by 31,503 bbl. to 28,352 bbl. daily, to permit engineering tests. The reduction was effected by reducing the number of producing days from 20 to 18 this month.

Among the

Drilling Contractors

New Drilling Firms Are Organized

Five new drilling companies have been formed in recent weeks throughout the country. H. L. Roberts and A. D. Rushing, former vice president of Rocky Mountain Drilling Co., Los Angeles, have organized the firm of **Rushing & Roberts** with an office in Bakersfield.

Sabine Drilling Co. has been chartered in Shreveport, La., with $300,000 preferred stock. Officers are: H. R. Dickerson, president; F. E. Wimberley, vice president, and C. E. Ray, secretary-treasurer. The company has bought a 10,000-ft. heavy-duty power rig and J. H. Halbert will be in charge of drilling operations.

James L. Patterson, Everett G. King, and Carl Jones, all of Duncan, Okla., have incorporated **Pat Drilling Co.** with capital stock of $50,000. Jerry C. Hawkins, Dallas, and John W. Graham, Houston, have formed **Hawkins & Graham, Inc.,** with headquarters in Dallas.

D. A. Hurst has set up his own drilling concern at Falls City, Neb. Hurst was formerly associated with Casper Core Drilling Co.

Commonwealth Drilling Co., of Calgary, Alta., is adding a light drilling rig and mobile service unit for handling completions to its equipment in Lloydminster field, Alberta. Among its recent contracts there are Highwood-Lloyd 1, LSD 11, 13-48-28w3, now finishing, and Command-Globe 4, drilling in LSD 7, 15-47-27w3.

Karels & Federspeil, of Regina, Sask., are finishing Eleco 1, NE LSD 14, 35-48-28w3, in the Lloydminster-Saskatchewan area.

Shaw Petroleums, of Lloydminster, Alta., have contract for Dimsdale 2, SW LSD 2, 14-50-2w4, testing the northwest extension of the Lloydminster field.

Ray-Harris Drilling Co. will drill Sun Oil Co. 1 W. I. Tubb, 660 ft. out of the northeast corner of the B. L. Anthony Survey, in Jameson field of Northwestern Coke County, West Texas. Rotary rig was being moved to the new site, from Sun's third producer in the field, the 1 Homer H. Jameson. The 1 Homer H. Jameson was the first well in the new field to be acidized. Following a treatment of 5,000 gal., it flowed 106 bbl. of clean oil in 10 hours from perforations at 6,200-6,458 ft., in the Strawn.

Crow Drilling Co. had operations under way and was below 3,300 ft. at Stewart-Lewis et al 2 H. Moore, in NE NW SE 14-16s-25w, in Spirit Lake field, Lafayette County, Arkansas.

Earl Wakefield will use cable tools in drilling the Nabel & Gussman et al 2 Krug, in SE NW NW 3-15-14, Russell County, Kansas.

T. S. Cox, Evansville, Ind., has cable tools on location for the Chester Oil Co. 10 G. W. Schoultz, C NE SE 17-1s-9w, Gibson County, Indiana.

Union Drilling & Development Co., of Calgary, Alta., has the contract to drill a joint test for a group of Calgary companies headed by Globe Oil and Leduc West on the Chary lease, E½ 23-50-26w4, in the Leduc field, central Alberta. The same company has contract for a 2,500-ft. Devonian limestone test for Homestead Consolidated in the Baxter Lake area.

H. & T. Drilling Co. is drilling contractor on the W. L. Hartman 2 Rempe, in CE½ NW SE 21-9-18, Rooks County, Kansas.

Texola Drilling Co., Oklahoma City, is rigging up for its 1 Canard, NW NW SW 33-10n-10e, north of the Wetumka area, Okfuskee County, Oklahoma.

Earl F. Wakefield, Wichita, Kans., and Bradley Brothers have announced a wildcat to be drilled, the 1 M. A. Rolf, C NW SW 5-30-11w, northeast Barber County, Kansas. Phillips Petroleum Co. and Stanolind are supporting this test.

Strom Drilling Co. will drill the H. E. Walton 1 E. O. and Mabel Pickett, in NE NW SW 5-21n-12w, Newaygo County, Michigan.

Derby Drilling Co. and others have tools below 2,500 ft. at the 1 Phillips, in NE NE SW 12-16-13, 2 miles west of Beaver pool, in Barton County, Kansas. The site was farmed out by

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Drop-Forged • Heat Treated • 2 Sizes
Durbin-Boomer F-1—2 swivels, 3/8, 7/16 or 1/2" chain
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Malleable Iron • Heat Treated • 5 Sizes
MIDGET No. 1—1 swivel, 1/4" chain
DELTA No. 1—1 swivel, 3/8 or 3/8" chain
DIXIE No. 1—2 swivels, 7/16 or 1/2" chain
LONE STAR 1—2 swivels, 7/16, 1/2 or 5/8" chain
LONE STAR 2—2 swivels, 1/2, 1/2 or 5/8" chain

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Stanolind Oil & Gas Co., and Black-Marshall Oil Co. is also contributing acreage to the test.

Lupher Drilling Co. will drill on contract the Pure Oil Co. B-1 Aisher-Dent, in N½ SW SE 6-15n-6w, Isabella County, Michigan.

Justrite Drilling Co. was starting for a 4,300-ft. test at its 1 Walter Orr, in SW NE NW 32-15n-7e, Creek County, Oklahoma.

Gregg Drilling Co., Palestine, Tex., will drill a Woodbine test for Humble Oil & Refining Co. in Leon County, Texas, across the Trinity River from the main Navarro Crossing field in Houston County. It will be that area's first operation in several months and will be the 1 Kittie Holley Unit. Location is on an 18-acre tract, falling in both the William Little and T. O. Harris surveys.

Western Drilling Co., Longview, Tex., will be the drilling contractor on the Al P. Groebl 1 Jess Koy. This wildcat is located 1,980 ft. from south and 660 ft. from west lines of Section 34, Block L, GH&SA Survey, Schleicher County, Texas. Drilling to around 6,000 ft., to test for production in the Strawn-Pennsylvanian, will be started soon.

Northern Development Co., of Edmonton, Alta., which recently completed Ace 2 in the Saskatchewan section of the Lloydminster field, is starting Ace 3 in SE LSD 5, 7-49-27w3.

Exploration Drilling Co., Electra, Tex., is drilling on its wildcat 1 Guy E. Gabbert, west half Section 360, Goliad C.S.L. Survey, 4 miles southeast of McCaulley, Jones County, Texas.

Regent Drilling Co., of Calgary, Alta., has started Globe G. & L. 2, SE LSD 4, 2-50-1w4, in the northwest extension of the Lloydminster field.

Arrow Drilling Co., Tulsa, has set surface pipe for its A-2 Union Saw Mill, NW NW SE 8-18s-12w, 4 miles west of New London field, Union County, Arkansas.

Scott Drilling Co. has received contracts to drill three wells for the Top O'Michigan Development Co. in Otsego pool, Otsego County, Michigan.

Cache Creek Drilling Co. is drilling an Ellenburger test for B. F. Weekly, his 1 Barber, NE NE NE 9-1s-15w, Tillman County, Oklahoma. This wildcat is 12 miles east of Manitou.

Harry Stroud has been awarded contracts for three wildcats and a West Monterey well in Allegan County, Michigan. The wildcats are the S. L. Findley 1 Stegeman, SE SW SW, 32-2n-13w, the Michigan Devonian Petroleum Co. 1 Troike, SW SE NW, 33-4n-12w; and the 1 Kloska, NE SE NE, Section 34, of the same company. The West Monterey well is the L. C. Sleep 1 Caywood, NW NW SE, 17-3n-13w.

Barnett Drilling Co., Wichita, Kans., has completed for a producer its 1 Anderson "B" with a potential of 3,000 bbl. per day. This Arbuckle lime well is in NW NE NW 21-9-21w, Graham County, Kansas.

C. E. O'Neal & Co., Evansville, Ind., has the drilling contract for the W. F. Lacy 1 Sam H. Wood, a wildcat in SW SW SW 26-6s-7e, Hamilton County, Illinois.

Halko Drilling Co., Shawnee, Okla., and Charles Balph are spudding their 1 Wills, SW NE SE 12-11n-6e, North Keokuk pool, Pottawatomie County, Oklahoma.

Big Chief Drilling Co., Oklahoma City, and Vaughey & Vaughey have reached the oil sand at 6,168-71 ft. and are setting casing on their 1 Beack, Lot 108, 36-6n-2w, Adams County, Mississippi.

Stearns Drilling Co., Russell, Kans., and Vernon Oil & Gas Co. have brought in their 5 Olson for an estimated 48 bbl. per day. Pay is in the Lansing-Kansas City lime and the well is in CSL NW NW 27-14-14w, Russell County, Kansas.

Loffland Brothers Drilling Co. is moving in for a 9,000-ft. test to seek the Reagan sand on east side of the south end of Oklahoma City field. This test, the 5 Farley, is in SW NE NW 19-11n-2w, Oklahoma County, Oklahoma.

Cap Rock Drilling Co. has spotted its 2 Charles Wadsworth 1,126 ft. from east and 187 ft. from north lines, DL&C Survey A-713, Wichita County, Texas. This well is a 1,700-ft. test in the Sunshine Hill field 4 miles northeast of Electra.

N. H. Wheless Drilling Co., Shreveport, is moving in for the T. L. James & Co. 1 Miller, 36-23n-2w, Union Parish, North Louisiana. This location is 2 miles northeast of the Lillie townsite and is on a block of 8,000 acres.

Barnett Drilling Co., Wichita, Kans., is converting to a salt-water-disposal well its 4 Boland, SE SE NW 16-9s-21w, Graham County, Kansas. This well had Arbuckle at 3,741 to 3,811 ft., total depth.

H. & M. Drilling Co., Leon, Kans., and Joe Morine are moving in cable tools for their 1 Kienda, 15-19-4e, 2½ miles northeast of Marion, Marion County, Kansas.

Iron Drilling Co., Tulsa, has started drilling for a 2,725-ft. test in NW NW SE 11-6n-8e, Hughes County, Oklahoma. This company also has staked location for its 1 Bottom, in SE SE NW 11-6n-8e, in the New Spaulding pool, Seminole County, Oklahoma.

Keyes Drilling Co., Elmwood, Kans., and Tom Allan have completed an extension well to the Wherry pool, Rice County, Kansas. The well, in SE SE SE 35-20-7w, 3 miles north of the Wherry, pumped 67 bbl. oil in 24 hours from conglomerate at 3,423-26 ft.

Lincoln Drilling Co. has moved in tools for a wildcat test of its own in NW NE NW 15-13n-9w, Deerfield Township, Mecosta County, Michigan.

Big Chief Drilling Co., Oklahoma City, has completed its 1 Marshall in Southwest Wayne pool, McClain County, Oklahoma, for the fifteenth producer in this pool. The well, in NW SE SE 14-5n-2w, flowed 10 bbl. of 44°-gravity oil per hour through a ½-in. choke. Total depth is 6,938 ft. with production from perforations at 5,920 ft.

Falcon Seaboard Drilling Co., Jennings, La., has staked location for an 11,500-ft. wildcat, its 1 Williams Cypress, in SW NE 39-14s-14e, Assumption Parish, Louisiana. The location is in the Bayou Platten area 7 miles east of production in West Lake Varret pool.

Mealy-Wolfe Drilling Co., Tulsa, has staked location to drill 2 Ferguson for R. H. Pierce, SE SE SW 9-6n-8e, in Spaulding pool, Hughes County, Oklahoma. Mealy-Wolfe is also rigging up for a test in the Booch sand at 2,900 ft. at their 1 Long, SE NE NW 14-5n-9e, in Long pool, Hughes County.

George & Wrather, Mount Carmel, Ill., have their pits dug for a wildcat, the Cherry-Kidd 1 Robert A. Irish, SW SW SE 11-1n-10e, Edwards County, Illinois.

Commonwealth Drilling Co., of Calgary, Alta., has the contract to drill Imperial-Leduc 5, LSD 8, 21-50-26w4, in the new Leduc field southwest of Edmonton.

Glen Peel, Hoisington, Kans., is rigging up rotary tools for Derby Oil Co. 1 Cox, 33-9-21w, 2 miles southwest of Morel pool, Graham County, Kansas.

H. M. Williams, Flora, Ill., is moving in material for the C. F. Brehm 1 Irvin Bailey, SE NE SE 14-4n-5e, Clay County, Illinois.

Benton Ross Drilling Co. and W. Duncan have opened a new shallow pool with their 1 Dugan, SW SE SW 5-5s-11w, a wildcat southwest of Randlett, Cotton County, Oklahoma. This test is producing an estimated 125 bbl. per day from sand at 1,577-90 ft.

Harbar Drilling Co., Wichita, Kans., is drilling the J. M. Huber Corp. 1 Baugher "A," 22-12-21w, 1 mile south of the new Cotton-East pool, Trego County, Kansas.

Hartman & Jordan, Mount Vernon, Ill., is moving on location for two Carter Oil Co. wells. The first is the 10 Irvin Hale, NE NW NE 1-6s-6e, in Hamilton County, Illinois, and the second is the 1 Clift Hours, NW NE SW 23-1s-12w, Gibson County, Indiana.

E. C. Norwood Drilling Co. is drilling below 2,000 ft. on its wildcat, the 2 O. H. Dodson, Section 49, Block 10, H&TC Survey, Hardeman County, Texas.

Delta Drilling Co., Evansville, Ind., is moving in rotary tools for the I. B. Browning 9 C. E. Springer, 9-N-23, 600 ft. west No. 6, Webster County, Kentucky.

Brack Drilling Co. and Apex Oil Co. have staked location for a wildcat, the 1 Hagerman, C NW 22-19-16w, about 2½ miles northwest of the Ryan pool, Rush County, Kansas.

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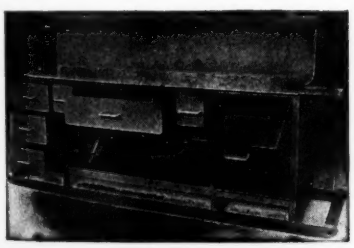

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STATISTICS and T

WEEKLY WELL COMPLETIONS . . . WEEK ENDED MAY 10, 1947

	Total of all wells					Cum		Wildcat completions and discoveries									
													Cumulative total, 1947				
	Comp.	Oil	Gas	Dry	Footage	1947	1946	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	19	10	0	*9	27,529	450	562	0	0	0	0	0	3	0	0	2	5
Pennsylvania	52	23	8	†21	81,692	1,074	1,433	0	0	0	0	0	0	0	0	0	0
West Virginia	11	0	10	1	34,960	278	250	0	0	0	0	0	0	0	1	0	1
Ohio	19	0	10	9	58,131	439	400	0	0	1	●	1	0	0	3	18	21
Indiana	10	5	0	5	20,229	195	108	1	0	0	1	2	6	0	0	16	22
Kentucky	14	1	2	11	34,372	186	155	0	0	0	1	1	5	0	0	19	24
Illinois	29	16	0	13	72,625	658	749	0	0	0	5	5	19	0	0	92	111
Michigan	9	4	2	3	20,557	210	251	0	0	0	2	2	3	0	5	69	77
Kansas	45	23	10	‡12	145,283	870	704	0	0	2	6	8	14	0	9	101	124
Neb., Mo., Iowa	0	0	0	0	0	2	7	0	0	0	0	0	0	0	0	2	2
Oklahoma	73	46	3	‡24	184,802	1,409	835	1	0	1	7	9	28	2	5	249	284
Texas	170	117	8	45	797,459	2,970	2,844	11	1	1	22	35	105	17	27	448	597
North Central (Dist. 7B & 9)	57	34	2	§21	179,594	937	988	2	0	0	7	9	39	0	5	151	195
West (Dist. 7C & 8)	37	28	1	8	171,245	696	598	0	0	0	5	5	10	0	2	54	66
Panhandle (Dist. 10)	4	3	0	1	11,795	147	135	0	0	0	0	0	1	0	1	0	2
Eastern (Dist. 5 & 6)	17	10	5	2	113,358	178	272	1	0	1	3	5	3	0	2	42	47
Gulf Coast (Dist. 3)	29	23	0	6	183,190	558	645	4	1	0	3	8	26	12	11	92	141
Southwest (Dist. 1, 2, & 4)	26	19	0	7	138,277	454	206	4	0	0	4	8	26	5	6	109	146
Louisiana	18	15	1	2	79,533	408	466	0	1	0	1	2	12	8	2	54	76
Northern	10	7	1	2	25,648	199	240	0	0	0	1	1	0	0	0	31	31
Southern	8	8	0	0	53,885	209	226	0	1	0	0	1	12	8	2	23	45
Arkansas	6	3	0	3	20,969	84	66	0	0	0	2	2	0	0	0	14	14
Mississippi	20	10	2	8	184,817	137	83	0	0	0	3	3	0	0	1	27	28
Southeastern States	0	0	0	0	0	15	15	0	0	0	0	0	0	0	0	13	13
Montana	5	2	1	2	8,554	60	88	0	0	0	1	1	0	0	0	9	9
Wyoming	1	1	0	0	4,745	75	57	0	0	0	0	0	6	0	2	12	20
Colorado-Utah	4	3	0	1	26,201	61	44	0	0	0	1	1	1	0	0	12	13
New Mexico	2	2	0	0	14,306	175	137	0	0	0	0	0	4	0	1	13	18
California	41	34	0	7	157,039	700	661	0	0	0	7	7	17	0	2	102	121
Total United States	548	315	57	176	1,973,803	10,456	9,915	13	2	5	59	79	223	27	58	1,272	1,580
Total previous week	527	277	56	194	1,857,695	9,908	9,337	5	0	7	78	90	210	25	53	1,213	1,501
Total May 11, 1946	579	314	59	206	1,818,294			7	1	1	65	74	181	19	41	1,107	1,348

Service wells included: *9, †19, ‡2, §1.

CRUDE PRICES AND REFINERY ACTIVITY

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Tex.*	West Tex.†
18-18.9	$1.40	....	....	....
19-19.9	1.45	....	....	....
20-20.9	1.49	$1.55	....	$1.42
21-21.9	1.53	1.57	....	1.44
22-22.9	1.57	1.59	....	1.46
23-23.9	1.60	1.61	....	1.48
24-24.9	1.64	1.63	$1.86	1.50
25-25.9	1.68	1.65	1.88	1.52
26-26.9	1.71	1.67	1.90	1.54
27-27.9	1.75	1.69	1.92	1.56
28-28.9	1.79	1.71	1.94	1.58
29-29.9	1.82	1.73	1.96	1.60
30-30.9	1.86	1.75	1.98	1.62
31-31.9	....	1.77	2.00	1.64
32-32.9	....	1.79	2.02	1.66
33-33.9	....	1.81	2.04	1.68
34-34.9	....	1.83	2.06	1.70
35-35.9	....	1.85	2.08	1.72
36-36.9	....	1.87	2.10	1.74
37-37.9	....	1.89	2.12	1.76
38-38.9	....	1.91	2.14	1.78
39-39.9	....	1.93	2.16	1.80
40 and above	....	1.95	2.18	1.82

*For crude from Laboval, El Campo, and Sandy Point. †Includes Lea County, New Mexico.

A.P.I. REFINERY REPORT, WEEK ENDED MAY 3

District—	Crude runs, daily avg.	Production				Stocks at refineries, bulk terminals, in transit and in pipe lines			
		Gasoline†	Kerosene	Gas & dist. oil	Residual	Gasoline*	Kerosene	Gas & dist. oil	Residual
East Coast	789	1,858	243	1,151	1,523	22,935	4,422	9,357	6,006
Appalachian:									
(District 1)	94	280	47	82	77	2,593	179	391	246
(District 2)	67	236	20	37	123	1,138	39	75	89
Ind., Ill., Ky.	807	2,596	376	814	951	21,333	1,306	2,660	1,921
Okla., Kans., Mo.	406	1,342	215	397	466	10,199	375	1,104	934
Inland Texas	223	1,059	102	115	382	4,394	214	298	745
Texas Gulf	1,058	3,069	481	1,344	1,310	14,013	1,255	5,199	5,138
Louisiana Gulf	378	1,031	325	397	442	5,530	721	1,862	989
N. La. and Ark.	52	147	42	44	75	2,047	205	401	100
Rocky Mountain:									
New Mexico	12	39	4	9	20	77	15	35	47
Other	118	371	16	144	208	2,957	64	482	678
California	812	2,355	33	760	2,259	16,289	765	10,035	26,051
May 3, 1947	4,816	14,383	1,904	5,294	7,836	103,505	9,560	31,899	42,944
May 4, 1946	4,664	13,788	1,917	5,346	8,861	98,196	11,042	32,485	40,039
April 26, 1947	4,725	14,213	2,123	5,435	8,186	103,860	9,724	32,286	42,668

*Finished and unfinished. †At refineries including natural blended.

Bureau of Mines crude-oil stocks 237,140,000 bbl. as of May 3—up 1,757,000 bbl. One year ago 221,911,000 bbl.

FLAT CRUDE PRICES

Representative posted schedules per bbl.

East Texas	$1.95
Kettleman Hills, California*	1.94
Beauregard Parish	1.90
Illinois Basin	2.07
Pecos County, Texas (Yates)	1.65
Bradford, Pennsylvania	3.51
Eastern Ill. and Western Ind.†	2.07
Tomball, Texas Gulf Coast	2.10

*37°-37.9°. †35° and above.

TRENDS

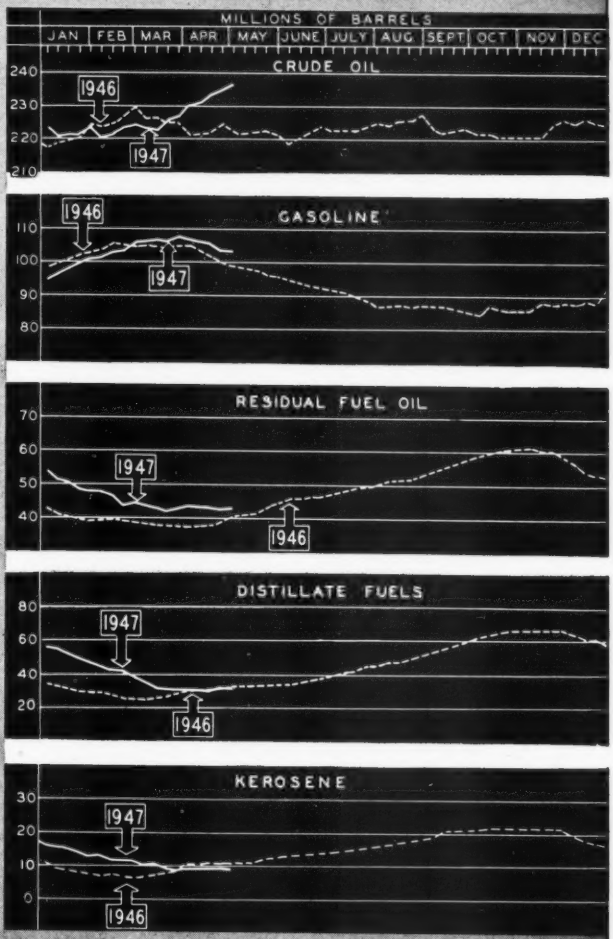
DAILY AVERAGE PRODUCTION FOR WEEK

	May 10 crude oil	B. of M. May demand	May 3 crude oil
Alabama	1,150	1,200	650
Arkansas	81,500	79,000	80,950
California	911,700	875,000	908,300
Colorado	38,390	39,000	39,390
Eastern	66,000	65,200	64,500
Florida	460	300	540
Illinois	189,400	210,000	185,700
Indiana	18,100	18,000	18,200
Kansas	278,650	275,000	279,750
Kentucky	25,900	29,000	24,900
Louisiana	420,500	411,000	418,345
North Louisiana	104,500	.....	104,150
South Louisiana	316,000	.....	314,195
Michigan	41,150	47,000	39,705
Mississippi	89,650	86,000	86,900
Montana	23,460	24,000	22,390
Nebraska	600	700	600
New Mexico	105,350	102,000	103,385
Oklahoma	385,700	380,000	385,800
Texas	2,226,850	2,120,000	2,183,505
Dist. 1 (Southwest)	21,100	.....	20,850
Dist. 2 (Southwest)	159,160	.....	158,335
Dist. 4 (Southwest)	243,415	.....	242,370
Dist. 3 (Gulf Coast)	485,170	.....	481,905
Dist. 5 (Eastern)	38,360	.....	38,130
Dist. 6 (Eastern)	112,500	.....	111,770
East Texas field	338,000	.....	335,860
Dist. 7C (West)	36,795	.....	36,440
Dist. 8 (West)	530,125	.....	498,570
Dist. 7B (W. Central)	38,200	.....	37,360
Dist. 9 (N. Central)	137,800	.....	136,655
Dist. 10 (Panhandle)	86,225	.....	85,260
Wyoming	111,140	108,000	109,710
Miscellaneous	.....	600	.....
Total United States	*5,015,650	4,871,000	4,953,220
Change from prev. wk., up	62,430		

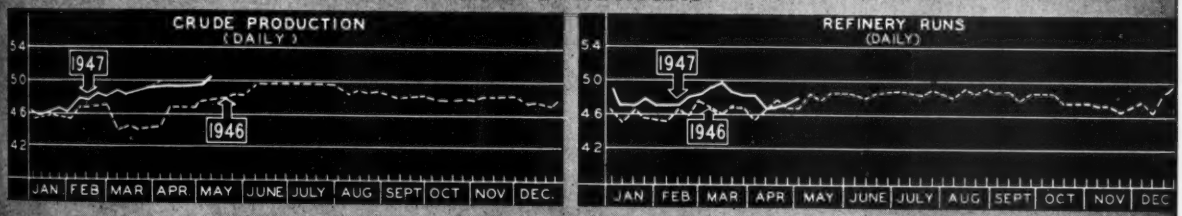
Total production January 1-May 10..... †629,381,985 bbl.
Same period last year (crude plus cond.) 606,041,529 bbl.

*Not incl. 34,450 bbl. condensate. †Incl. 3,491,700 bbl. condensate.

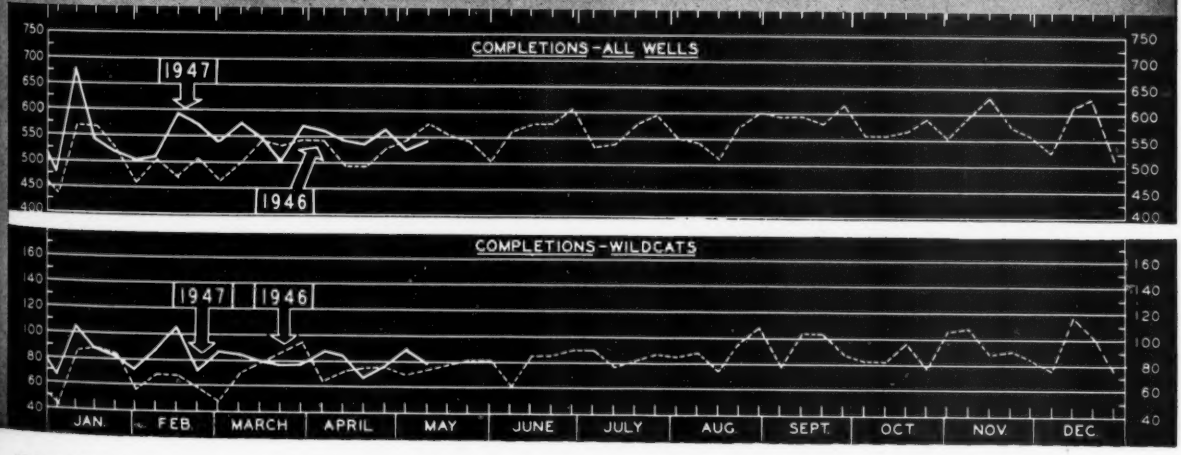
OIL STOCKS IN THE UNITED STATES

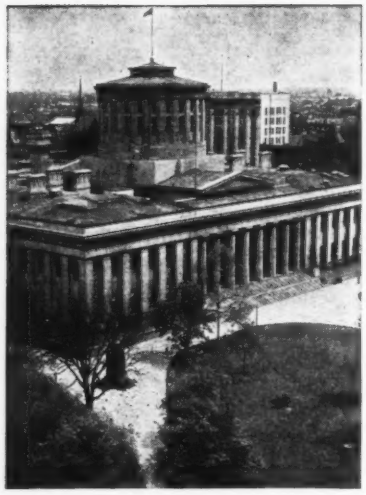


DAILY OPERATIONS



Solid line charts weekly completions, service wells in Eastern area included.





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MARKETS

SPOT-MARKET quotations for No. 6 fuel oil, which zoomed to $2.25 a barrel in some quarters last week, climbed past that figure early this week with some suppliers asking $2.50 a barrel in the buyers' tank cars.

Scarcity of the material, heavy though gradual increases in demand for the product, and a continued shortage of tank cars were given as the principal reasons for the continuing upward trend in the price of the product.

Speculation among shippers and suppliers ranged from predictions of a sudden price collapse in the near future to those of a continued heavy demand with the price climbing to $2.75 a barrel on the spot market.

Premium Increased

In New York the tight market on No. 6 this week was reported "tighter," with increases shown in the premiums which last week ranged 5 to 15 cents over the posted price of $2.22 a barrel.

Prices on other petroleum products remained unchanged during the past week, with all products reported tight. North Texas refiners reported natural gasoline in particularly short supply and said the product was "practically being shipped on open contract" with requests to "send everything you have."

Opinions on future gasoline demand varied from a leveling off in the near future and adequate supplies throughout the nation to an acute shortage before mid-summer. Salesmen for one independent Oklahoma refiner during the week were ordered to withdraw all gasoline quotations until further notice. Company officials said they were "not selling, even to regular accounts" until contract commitments could be taken care of.

In Washington, Secretary Krug, seeking a larger appropriation for the Department of the Interior, declared the nation is confronted with "a really serious petroleum problem" and may have a gasoline shortagge in 12 to 18 months.

Tank Cars Tighter

Optimism of suppliers and shippers regarding the tank-car shortage was changing to pessimism this week and most were expecting the shortage to get worse as summer approaches. Some pointed to the slow rate of tank-car manufacture, age of most of the cars now in use, and the huge problem of maintenance in predicting a more acute shortage of cars by next autumn. Slower turn-around time and longer hauls than were characteristic of the war years also were cited as heightening the shortage.

No slackening in demand for light burning oils was noted during the week, with supplies still reported tight. A sudden cold snap in the North and East increased demand for No. 2 and kerosene.

Shortage of all products was aggravated by continued strikes, which kept tied up about 5 per cent of the nation's refining capacity. During the week 12 more notices of intention to strike were filed by local unions against oil companies and related concerns, according to concilliation service officials in Washington.

Representative Quotations

Representative spot-market quotations of leading suppliers as of last Monday. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel.

GASOLINE, KEROSENE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor	Texas Gulf Coast
Regular gasoline, 73-75 octane	8-8.5	10.1-10.4* 9.2- 9.4†	7.75-8
Premium gasoline, 78-80 octane	8.75-9.5	10.2-12	8.5 -9
42-44 w.w. kerosene	6.875-7.25	7.8	6.75-6.875
No. 2 straw fuel oil	6.125-6.625	6.8-6.9	5.5-5.75
No. 6 residual	$1.90-2.25	$2.22	$1.55-1.70

*Branded (74-76 octane); †Unbranded (74-76 octane).

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5.375	4.875	5.125
Grade 18-55	6.45	5.85	6.15

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	11-12.5
750 vis., No. 3-4 neutral	13-15.25
2,000 No. 5-6 neutral	14.5-16.75

LUBRICATING OILS

Mid-Continent

150-160 vis. D bright stock, 0-10 p.p.	29
200 vis. No. 3 neutral, 0-10 p.p.	18-20

Western Pennsylvania

145-155 vis. 10 p.t. bright stock	42
180 vis. 0 p.t. neutral	42

CRUDE-SCALE WAX

130-132 A.S.T.M. melting point	7.75

Equipment Men in the News

Walter T. Johnson has been named New York district sales manager for the Columbia Chemical Division of Pittsburgh Plate Glass Co. His New York headquarters will be at 30 Rockefeller Plaza.

C. E. Ridley, formerly chief clerk in the Lindsay, Okla., store of Bethlehem Supply Co., has been promoted to field representative in that area. Also **J. J. C. LeFlore,** formerly floorman at Seminole, Okla., and more recently at Lindsay, has been advanced to assistant store manager at Lindsay.

Lufkin Foundry & Machine Co., Lufkin, Tex., announces the opening of its new office at 537 Commerce Exchange Building, Oklahoma City, April 1. The office is in charge of **Cooper Richards,** former manager of the Kansas area with offices at Great Bend. The new office handles sales and service of Lufkin equipment in the Oklahoma City and Kansas area. **Linville E. Caraway,** sales engineer, and **J. D. Bradley,** service engineer, will continue in the Great Bend office. **Newell Lynch** is in charge of service in the Oklahoma City area.

A. M. Mull, Oklahoma district geologist, and **Lynn Trombla,** geophysicist, have resigned their positions with Superior Oil Co. in Oklahoma City and will launch a new firm, Midwest Exploration Co., in Oklahoma City as soon as seismograph equipment is available.

Jack W. Askins, who joined the New York office of American Iron & Machine Works Co. last October after 56 months service in the armed forces, is making a month's tour of the Mid-Continent oil fields studying equipment developments. After he returns to New York, he plans an extended tour of European oil fields.

A. R. Robinson has been named manager of the Seattle branch of John A. Roebling's Sons Co., Trenton, N. J.

Fred S. Dewel has been named Rocky Mountain agent for Larkin Packer Co., Inc. Dewel will be the exclusive representative for all products throughout the Rocky Mountain area.

Young Radiator Co., Racine, Wis., manufacturer of heat-transfer equipment, has announced the addition to its staff of **James A. Stahn** as engineering representative.

Dennis F. McCarthy has been named manager of the new tubular goods division of A. O. Smith Corp., Milwaukee, a division which handles the manufacture and sale of steel pipe for oil and natural-gas lines and oil-well casing.

Petro-Chem Development Co., Inc., has announced appointment of **M. A. Grizzle** as its Pacific Coast sales representative, for its line of furnaces, heaters, reboilers, superheaters, and other direct-fired equipment.

At the annual meeting of stockholders of Macwhyte Co., Kenosha, Wis., the following directors were elected to serve until the next annual meeting: **Jessel S. Whyte, H. E. Sawyer, R. G. Whyte, R. P. Tyler, R. P. Cavanagh, J. T. Wilson** and **W. Robert Johnston.** Immediately following this meeting, the directors elected Robert P. Tyler vice president in charge of sales. He was formerly general sales manager. The following officers were re-elected: Jessel S. Whyte, president; H. E. Sawyer, vice president and treasurer; **R. B. White,** vice president in charge of operations; **M. A. Buntrock,** secretary; **E. C. Berg,** assistant secretary.

Frank E. Lobaugh, formerly technical service manager, has been appointed technical service director of the Lumnite Division, Universal Atlas Cement Co., United States Steel Corp. subsidiary. In 1941 Lobaugh joined the company in the technical division and sales department. In 1944 he was appointed technical service manager which position he has held until his appointment as technical service director.

Edwin M. Ott, chemical engineer in the market research department of Pennsylvania Salt Manufacturing Co., Philadelphia, has been named assistant manager of market research. **Arthur F. Bixby,** heavy-chemicals salesman in the Philadelphia office for the past 9 years, has been transferred to the Pittsburgh office.

The Heil Co., Milwaukee, has announced the appointment of **Leonard C. Anderson** as district manager of District 8, covering

L. C. ANDERSON

HERMAN WAGEN

the southwestern states of California, Arizona, and Nevada, with headquarters at Los Angeles. **Herman Wagen** has been named district sales manager for the north central states of Wisconsin, Michigan, Illinois, Indiana, Ohio, and Kentucky, with headquarters at Milwaukee. **Karl Mindemann,** who has been with The Heil Co. for 10 years in various supervisory positions, will take over as sales coordinator in Milwaukee.

Announcement by Thermoid Co. of the appointment of **Henry E. Holden** and **Louis Benton** as original equipment sales engineers for industrial friction material was made at Trenton on April 1. Holden will operate in the Michigan and Ohio area with headquarters at 17830 Cannon Avenue, Cleveland. Benton will have charge of the Indiana, Illinois, and Wisconsin area and his headquarters will be in Chicago.

Edgar A. Rogers, Chattanooga Bank Building, Chattanooga, Tenn., has announced the association with him of **Chester A. Rousch, Jr.** Rogers' long-established business is the analysis of process-plant requirements and the application of equipment specifically engineered to meet special as well as ordinarily encountered operation conditions.

Amos D. Moss, director of purchases for B. F. Goodrich Co. since 1920 and a member of the organization since 1899, will retire on July 1. He will be succeeded by **E. A. Stevens,** assistant to the director of purchases since April 1942, and with the company since 1928.

Jessop Steel Co., Washington, Pa., announces the firm name of Jessop's exclusive representative for the State of Wisconsin has been changed from L. E. Meidinger Co., Inc., to Bell Steel Sales, 606 West Wisconsin Avenue, Milwaukee.

Rudolph E. Reimer, secretary and treasurer of Dresser Industries, Inc., Cleveland, Ohio, was also elected a vice president of the company at a meeting of the board of directors in New York, April 22.

Bailey Meter Co., Cleveland, announces the assignment of three engineers to the company's branch offices. **R. L. Stewart** reports to Denver and **L. E. Bartel** to Kansas City. **G. D. Williams** is being assigned to Atlanta after temporary duty in Boston.

The Chicago offices of Tube Turns, Inc., Louisville, have been moved to suite 904 Fairbanks-Morse Building. The new and larger offices will be the headquarters for **George C. Anderson,** district manager of Welding Fittings Division, and **Donald A. MacNeil,** district manager, Forging Division, and their staffs.

Announcement has been made by Snap-on Tools Corp. of Kenosha, Wis., of the opening of the company's 40th factory outlet at 421 N.P. Avenue, Fargo, N. D. **Louis J. Johann,** formerly a field man with the Minneapolis branch, will manage the Fargo office.

Cecil E. Edwards, graduate of the Journalism School at Southern Methodist University, has been appointed field representative in the public relations department of U. S. Steel Corp. subsidiaries, Southwest Division, Dallas. The district includes Texas, Oklahoma, and New Mexico.

Northwest Engineering Co., builders of shovels, cranes, draglines, and pull-shovels, announces the removal on May 1, of its executive and sales offices to new and larger quarters in the Field Building at 135 South La Salle Street, Chicago.

A. J. Fischer has been appointed manager of the Carbide and Cast Alloy Division of Jessop Steel Co., Washington, Pa. according to an announcement by M. M. Eicher, works manager.

The Bird-Archer Co., specialists in industrial water treatment, have just appointed the John H. Carter Co., New Orleans, as representative in Louisiana, southern Arkansas, eastern Texas, and southern Mississippi.

C. W. Main has been appointed a field representative of Plomb Tool Co., Los Angeles. He is headquartered in Denver, and his territory includes Colorado, Wyoming, and parts of South Dakota and Nebraska. He serves under **J. J. Buhler,** regional sales manager.

Lindberg Engineering Co., Chicago, and Fisher Furnace Co., Chicago, have recently united their organizations. Under the new arrangement the Fisher organization will be known as Fisher Furnace Division, Lindberg Engineering Co. **Kenneth D. Hoke,** former vice president of Fisher Furnace Co., will head this division. Fisher furnace manufacturing and office activities have been moved to the main Lindberg office and plant at 2444 W. Hubbard Street, Chicago. Refractories will continue to be manufactured at a second plant located at 5535 North Wolcott, Chicago.

The Tulsa offices of Titan Metal Manufacturing Co., Bellefonte, Pa., have been moved from 310 Thompson Building to

1348 South Indianapolis Street, Tulsa. **J. A. Gulick,** sales representative, is in charge.

W. O. Calvert, prominent in South American oil circles for many years, having been with Standard Oil Co. of Venezuela from 1925 to 1935, has announced plans for opening offices in London in the near future to represent A-1 Bit & Tool Co., Mission Manufacturing Co., and Thornhill-Craver Co. (Unibolt) in the Near and Far East.

Lee & Bryson Sales & Service Co., 1596 East Hill Street, Long Beach, has announced it is now the exclusive distributor for The Brewster Co., Inc., of Shreveport, La., in California, Wyoming, Montana, Colorado, Mexico, and Canada. It will handle the complete line of Brewster oil-field drilling equipment. The firm is headed by **C. T. "Tut" Lee** and **H. S. "Sent" Bryson.**

United States Rubber Export Co., Ltd., has been selected by Prufcoat Laboratories, Inc., as export distributors for its line of protective coatings and transparent waterproofing.

The Warman Steel Casting plant has been purchased by Los Angeles Steel Casting Co. effective April 14. Top management of the merged firms will be as follows: **C. G. Tibbette,** president and general manager; **E. S. Atkins,** secretary and treasurer; **Ralph A. Lewis,** sales manager; **Walter Berger,** assistant sales manager; **G. B. Emmett,** works manager; **W. B. Emmett,** superintendent of both plants, and **Carl Wissman,** chief metallurgist.

At the annual stockholders' meeting of the Edwin H. Fitler Co., **N. Myers Fitler,** who had been president of the company since 1925, was elected chairman of the board. **Cooper Howell,** former vice president and an active associate of the concern for many years, will succeed Fitler as president. **Nathan M. Fitler, Jr.,** was elected vice president and will be in charge of manufacture. **Henry Hamscher, Jr.,** former secretary, will now hold the position of second vice president in charge of sales. **Joseph Waldmen, Jr.,** will be the new secretary, and **Dale B. Fitler, Jr.,** was elected assistant secretary.

At the annual meeting of stockholders of Arthur G. McKee & Co. at Cleveland, the recent action of the company's board of directors amending the by-laws whereby the number of directors was increased from five to seven was ratified by the shareholders. **R. E. Baker, William A. Haven, Arthur G. McKee, T. W. Rutledge,** and **H. E. Widdell** were reelected to the board. New directors are **H. R. Moorhouse,** secretary, and **James Krumhansl,** treasurer of the company. Present officers were all reelected at the annual organization meeting of the board which followed the stockholders' meeting.

Black, Sivalls & Bryson, Inc., has consolidated its oil-field-equipment operations in Mississippi in the newly opened branch at Brookhaven. **Ted Falls,** manager of the recently closed Natchez branch, and **Tom R. Sessums** will operate the Brookhaven branch. Other shifts made by B. S. & B. include three branch managers. **Ed Poole,** who has been manager at Salem, Ill., has been sent to the Odessa, Tex., branch. **Harrell Bruner,** formerly of Carmi, Ill., has moved to the Salem spot, where he will assume the managership. **Andy Shaw** has been sent from Oklahoma City to direct the Carmi branch.

E. A. Warren, vice president of The General Detroit Corp., and **Harry F. Maxon,** vice president of Boston Woven Hose & Rubber Co.; announce a new marketing arrangement on Boston woven hose. Effective immediately, The General Detroit Corp., and its West Coast subsidiary, The General Pacific Corp., will be national distributors for fire hose manufactured by Boston Woven Hose & Rubber Co.

The A. P. Green Fire Brick Co. with general offices and plant at Mexico, Mo., announce the reorganization of management control into six major divisions: sales, affiliate and subsidiary companies, manufacturing, procurement and properties, finance, and industrial relations. **Herbert B. Plunkett** becomes director of sales which includes both domestic and export operations; **Arthur D. Bond** will be director of affiliate and subsidiary companies both domestic and foreign; **Lester J. Miller** becomes director of manufacturing; **Neal S. Wood** will be director of procurement and properties; **D. H. Kreutzer,** director of finance; and **Walter G. Staley,** director of industrial relations. All six men in this new alignment of A. P. Green organization functions are vice presidents and members of the company board of directors.

Walter N. Westland has been appointed eastern regional manager, and **George W. Stevens,** Mid-Continent regional manager,

W. N. WESTLAND

G. W. STEVENS

of Cummins Engine Co., Inc., Columbus, Ind. Westland has been general sales manager of the Marion Power Shovel Co., Marion, Ohio, for the last 3 years. As manager of the Cummins eastern region, his headquarters is at 6303 Chrysler Building, New York City, and his territory includes New York, New Jersey, Pennsylvania, Maryland, and the five New England states. Stevens has headquarters at 1812 Fair Building, Fort Worth. His territory covers Texas, Oklahoma and Louisiana.

A new oxygen filling station and acetylene-producing plant are being built at Stockton, Calif., by The Linde Air Products Co., unit of Union Carbide & Carbon Corp. A warehouse for Union Carbide also will be constructed. The new plants are expected to be completed in the late summer.

Tuboscope, oil-field tubular goods inspection specialists, are now operating in Rangely field of Colorado and will shortly establish permanent offices in the Rocky Mountain area. For the time being the Rangely operations are being directed from headquarters in Houston. Also plans have been approved for extending the company's services to Mexico and Canada in the near future.

International Derrick & Equipment Co., Columbus, announces the following personnel changes: **Fred Knieff** has been appointed city representative in Dallas. He will have his headquarters in the Ideco Building at 1315 Pacific Avenue. **Arthur H. Knight** has been appointed machinery representative for Oklahoma and Kansas. He will make his headquarters in the Kennedy Building, Tulsa. **P. M. Kovack** has been named sales representative at Fort Worth. Kovack will have his headquarters at 1306 Commercial Standard Building. **Don Shaw** has been appointed machinery sales engineer for Texas, Louisiana, and Mississippi. Shaw will have his headquarters in the Ideco Building in Dallas.

John A. Aron has been appointed tire sales manager of United States Rubber Export Co., Ltd. For the past 7 years, Aron has been sales manager of the Fisk Tire Export division.

Directors of the Republic National Bank of Dallas have elected **C. B. Sullivan** a vice president. Sullivan assumed his new duties May 1. The new vice president resigned as assistant supervising examiner for the Southwest district of the Federal Deposit Insurance Corp. to join Republic's official staff.

American Coach & Body Co., Cleveland, announces two additions to the executive staff. **Robert W. Hadley** was appointed president and **Harold F. Smith,** treasurer; both were elected directors.

Henry C. L. Johnson has been appointed advertising manager of Rheem Manufacturing Co. **Carlton A. Johanson,** who has been manager of public relations and advertising for the company, is resigning to open an office in San Francisco to engage in public relations and industrial consulting.

Richard M. Lawrence, of Wilmington, Del., has been added to the staff of the development department of Monsanto Chemical Co. He will specialize in market-research work.

All phases of its advertising campaign have been placed under the supervision of the M. R. Kopmeyer Co., Inc., by Graff Engineering & Equipment Co., both of Louisville. **Walter C. Hellmann** is the account executive.

The appointment of **W. T. McCurdy** as district manager for the states of Tennessee and Arkansas is announced by Mack Trucks, Inc. In his new capacity McCurdy will supervise all of the company activities in these two states, including a dealer organization composed of 21 outlets. He will make his headquarters in Memphis.

Manhattan Rubber Division of Raybestos-Manhattan, Inc., Passaic, N. J., has announced that Asbestos Co. of California, 941 Sixteenth Street, San Francisco, will represent it in the San Francisco area.

Axelson Manufacturing Co., Los Angeles, announces the appointment of **Glynn Williams** as chief engineer to succeed **E. W. Ostrom** whose resignation was effective April 15, 1947.

GLYNN WILLIAMS

Richard E. Roberts, director of employe relations for the Fisher Body Division of General Motors Corp., joined Ford Motor Co. as director of the community-relations department.

Oswald Suter, for the past 11 years a member of Waltham Watch Co., has joined the staff of the Technical Oil Tool Corp., Ltd., as chief engineer in charge of manufacturing and development.

Truckstell Manufacturing Co., national distributing organization for special automotive equipment, observed its tenth anniversary with a 1-week convention at Edgewater Beach Hotel in Chicago, April 21-26. The 40 distributors from all parts of the United States and about 135 key personnel attended the convention for a discussion of sales, service, and other phases of the business. Earlier in the month **W. F. (Wally) Balzerick,** former western divisional manager, was appointed merchandising manager of the company.